The International Journal of
Orthodontia, Oral Surgery and Radiography

(All rights reserved)

VOL. XVII ST. LOUIS, MARCH, 1931 No. 3

ORIGINAL ARTICLES

PRESIDENT'S ADDRESS*

BY P. G. SPENCER, D.D.S., WACO, TEXAS

ALL of my predecessors have had the ability to bring you worth-while and important messages, to make constructive suggestions that have been helpful to all. They have presided over the annual sessions in such a manner that every meeting has merited the attendance of every member.

I feel that at the close of this meeting each of us can say with honesty and truth that we have enjoyed another week of study equal to any of our past sessions. If this be the case, I must now admit that I cannot claim one iota of credit, but must pass your thanks on to the Board of Censors, the committees, the members of local arrangement committee, and to the very efficient secretary-treasurer. To me it has been a delightful year of non-work, and I could ask for all of my successors no greater prize than that they may be blessed with such an excellent group of workers.

The history of our Society is well known to all of us; yet in passing I must mention that it was in this city, that a majority of us gained our initial working knowledge of the removable lingual appliance. I need not remind you of the benefits resulting therefrom.

Our Society was formed primarily as a study club, to permit an exchange of ideas, to avoid, if possible, the fault of one becoming the fault of all, that we might learn from each other, improve each other, and broaden and enlarge the concept of each of us in orthodontia and its allied subjects. From a materialistic or financial standpoint, we cannot all be De Sotos going wherever and whenever we desire in search of information; however, our combined sessions since our organization would total less than two months' time, yet we could not have exchanged ideas, or visited with each other and with the men outside of our membership who have met with us, in two

*Read before the Southwestern Society of Orthodontists, San Antonio, Texas, January 7, 8, 9, 10, 1931.

years' time. Our organization has made it possible to bring the mountains to us, which is something Mohammed failed to do.

Our Society has been especially favored in having meet with us men who are leaders, teachers, and older in the practice of our profession, who have given us, unstintedly, advice, counsel and the fruits of their failures and their successes, and also their time at a real financial loss, figured in actual dollars and cents. Personal mention is unnecessary, you have only to note the present and past programs.

I have not prepared numerous recommendations or suggestions for your consideration. If I can leave with you just one thought for study, I shall be amply satisfied.

By your consent and with your votes, you have placed me in a position to offer advice. Any that I may give will apply equally to myself.

A very definite trend of thought in our profession, the past few years, has been not so much how as why. Some progress is being made in placing treatment and prognosis in their proper sequence following diagnosis, and diagnosis is tending to become something more definite than magic wand waving, or a guessing contest similar to "How old is Anne?"

We chide our fellow dental practitioners about the futility of ever gaining much headway in the treatment of dental ills, unless they cure by prevention; yet we few in numbers confidentially attempt treatment of one-tenth of 1 per cent under the banner of "uplifting mankind." We are not excused because we do not see the trouble before it has become established. We must discuss our problems with our fellow general practitioners, who will in a measure see, if taught to see, and being greater in numbers, will in turn carry our problems to allied professions. In that, we must also help. Prevention may not ever totally prevent, but I hope we are all optimistic enough to believe that prevention carried to the nth power might help to eliminate a great many of the contributing causes of malocclusion in the many thousands yet unborn.

Let us be fair in this matter of educating our fellow dentist. He has problems equally as difficult, and he is not to be blamed because he does not give his whole time to preventing malocclusion. Let us be easy and diplomatic in some things, but let us be firm with him on stressing the value and care of the first dentition, of the need of having a healthy, growing, properly nourished, normal breathing human organism if we are to expect nature to produce a satisfactory product. We have no need to worry about the public. It is miles ahead of us now and seeking more definite knowledge, and is being told practically nothing of our problem by the family physician and very little more than that by the family dentist. Generally speaking, our best friends in the dental profession are referring very few desirable orthodontic cases to us. Our former patients are the real ambassadors.

Education for the prevention of malocclusion is a very definite problem confronting the orthodontist. Fifty to 75 per cent of our time today is being spent in overcoming ills that in a great measure could have been minimized or prevented. I am not advocating any theory of early treatment, I am en-

deavoring to direct your attention to that period that precedes early treatment. I am not theorizing on the elimination of the orthodontist, for any efforts toward prevention will increase the number of orthodontists and the cases treated, many fold, and will tend toward a more satisfactory and ideal practice and make possible greater good for a larger number.

In 1926 the advertising bill in America exceeded 2 billion dollars, which was three times the total for the year 1916. Yet this year the advertising agencies are making a nation-wide educational campaign, not solely to increase business, but also by pointing out the value of advertising to show the cause of failures, the possibilities of lessened cost, the methods to gain greater results for the consumer as well as for the producer, and for prevention not of the good but of the ills in advertising, based on the "truth and nothing but the truth" in advertising.

Our Society has a Committee on Public Health and Education, and I feel sure it is working with the idea of prevention in mind. The manner or method of gaining results presents difficulties. Diplomacy is necessary to avoid personal boasting locally. Interchanging ideas among ourselves by presenting educational orthodontic papers before each other's local dental and medical societies, parent-teacher associations, and child welfare societies, offers a solution to that phase, but of greater importance is the discontinuing of our past practices of "before and after" papers and slides before our dental societies.

Instead of securing help we only mystify our listeners as well as ourselves. We tend to stress mechanics, which increases the number of mechanical beginners. You are familiar with the results, and they are not advancing the scope and standing of orthodontics. Treating causes is not a cure-all. The flood cannot be prevented if we wait until the overflow. The late Theodore Roosevelt stated that "every man should give some of his time to advancement of his profession." We have an ideal opportunity, made more attractive by increased remuneration.

You may term all this just theorizing; possibly it is, but do not let that statement end everything or stop you from thinking about it. Such a decision would have made the Panama Canal just a myth, and if the practice of orthodontics only reaches the point of correction after a pronounced anomaly is apparent, it falls far short of its possibilities. The fact of the matter is that we choose to ignore those things about which we know very little, and about which any one knows very little. Allied professions can aid materially if they knew even a part of our problem.

Being raised under the staid old Presbyterian Doctrine that what is to be will be, I am adverse to believing wholly that we can do what we want to do, with whatever we want. The late Luther Burbank ignored that idea somewhat; however, he did not make his tests or prove his case with sickly, low grade stock. Applying the tenet of another religious faith, I must confess that I have never obtained the result I desired in any case treated, but I hope that I have helped each one to some degree.

We cannot produce a mammoth circus tent from a single square yard of fabric. We certainly do not discredit certain theories and established facts

of what may be or are the possibilities or limitations of the inherent factors in any specified individual, of environment, of diet, of normal metabolism, and of function. But the great question is, what are we going to do about it? Ninety per cent of my practice, and I judge an equal amount of yours, is devoted to treatment of effects not causes or to eliminate argument attempting to correct causes and hoping to overcome effects. However contradictory that statement may seem, the fact remains we do not start in the right manner or at the right place. Again let me state that I am not in the remotest manner making a plea for early mechanical treatment, but rather for the employment of those factors which we know, for I believe that progress will eventually be made in fields which are at present unknown.

I mention one apparently simple local thing as a point of argument. The dental profession has been taught and still is being taught, especially the dental student, at all costs to retain the deciduous denture in order that the space will be ample and available for future needs. So diligently has the teaching been followed, that all reason has been lost as to the time and proper sequence of removal. It is a well-known fact that a definite percentage of malocclusions is being caused by too early removal or loss of deciduous teeth without proper space retention. However, from observation of cases in orthodontic offices and in the general practitioner's offices, and even in the offices of several men devoting their entire time to the practice of dentistry for children, I have noted an equal amount of malocclusions developing through too long retention of deciduous teeth and through removal in improper sequence. In this day when the value of the x-ray examination in diagnosis is known, it does not seem possible that this should be true.

For fear that I have emphasized the early prevention aspect, I want simply to mention that we have the third molar problem to study under the heading of "Prevention of Malocclusions."

Summing this all up, let us continue to educate ourselves, let us not educate the public additionally just now, as it is far ahead of us, but do let us educate the people who take care of the public.

Just one other thought and I shall have more than taken up my time. We theorize and theorize on treatment and then run home, throw gentle pressure, individual normal, vitamins A to Z and all such kindred souls out of the window, and clamp on the positive action. We make bone grow where it never grew before. We are back again performing mysteries, and also mailing out the monthly claim checks. The Chinese, we are told, apply such positive methods on their feet, and yet you recall that one of our poets made some mention of the "Barefoot Boy." Do we wonder which fits in with what we discuss as normal cell metabolism and normal functional activity, etc.?

We hear much of how I do this and that, in such short periods of time that it verges on the miraculous. Radiographs of the field of operations where such *modus operandi* took place would probably present additional food for thought. The evidence of tooth movement presented at the worn approximal contact point is positive assurance that any tooth undergoing

any applied mechanical orthodontic treatment must be permitted some individual freedom during the process. Sufficient evidence is presented that ample pressure is available in auxiliary springs in gauges as small as 0.008. The fault or failure lies in the methods of application. Possibly a very small percentage of the force or pressure that is applied with our appliances is all that is necessary to secure the desired movements and changes in the supporting structures. Rotations do not need excessive application or force, but it is often applied because of the difficulty of applying a minimum amount. Rotations are usually made very rapidly, when as a matter of fact the changes that must necessarily take place are equally as much as with considerable tooth movement. Undesired elongating, depressing, or tilting teeth are not only simply evidence of incorrect application of force, but equally caused by application of an excessive amount. We discuss our problems under the subjects of the normal individual, normal function, physiologic tooth movements and biologic principles, but we continue to use mechanics as if we were the sole and direct masters of cell metabolism. Personally, I cannot understand how gentle stimulation or pressure can be demonstrated with any rigid, fixed attachment.

Now before we go on to the really important part of our meeting, let me in closing express my appreciation of your electing me to the office of President. The Southwestern Society has, I feel, been of more benefit to me in the practice of orthodontia during the past eleven years than has any other single agency. It has been the direct cause of friendships that I prize greatly and that I hope ever to retain. I know of no other society or association that expresses more whole-heartedly the spirit of good fellowship that we have in this Society. I honestly and sincerely thank you for the honor that you have bestowed upon me.

TRANSPOSED PRINCIPLES OF CONTEMPORARY ORTHODONTIC APPLIANCES*

By H. C. Pollock, D.D.S., St. Louis, Mo.

WHEN I was invited to appear on this program of the Southwestern Society of Orthodontists, I was given permission to choose my own subject. This granted entirely too much because giving one the leeway of choosing one's own subject at this particular time is more or less equivalent to making the suggestion that one ride one's own orthodontic hobbyhorse to one's heart's content.

It has been a pleasure, within the last few weeks especially, to listen to the remarks of some of our workers and thinkers who stand high in the science of orthodontia. Not unlike all other activities of the present day, orthodontia is going through a kaleidoscopic transition of thought and is shifting from old orthodontic ideas to younger ones, right or wrong.

We are in many instances breaking precedents and accepted doctrines of many years' standing, and are casting about for something better in order that our work may go on in as rapid strides as we should like to see it. As in all other transitions, some new ideas and new thoughts may be good, others may be bad, and we of course are eager to accept the good and to reject the bad as quickly as it is possible to sift them out, which depends entirely upon the test of time. We see an almost universal trend to view our orthodontic problems largely from the biologic standpoint, a tendency to look upon the process of the correction of malocclusion from the same perspective as we would look upon the general phenomenon of the growth and development of a child or a shrub or a blade of grass. We have learned to look upon the process, as Dewey has pointed out, as a mechanical interpretation of a biologic matter. We have turned away from the perspective which was similar to that of a concrete and steel construction process to one of metabolism, growth and development. We maneuver toward an architecturally completed design, which we call normal occlusion, by means of the growth of teeth, dental arches and osseous tissue.

It seems that we are shifting the perspective of our problems very rapidly for the better. This would indicate progress and a viewpoint which, being collectively assimilated by the orthodontists all over the world, should permit us ultimately to emerge carrying with us the banner of a profession which will have a much greater merit, a more scientific fundamental basis for its existence than it has today.

To be more specific, we have learned about muscle training and its effect on the development of the head, face and jaws; we have seen its therapeutic attributes put into practice and used in a definitely practical manner.

*Read before the Southwestern Society of Orthodontists, San Antonio, Texas, Jan. 7, 8, 9, 10, 1931.

We have seen delicate and subtle influences brought to bear on the development of the bones, causing them to grow in direction, shape and form in harmony with the influence exerted upon them. We have seen the pillow habits pointed out by Stallard of California, and the actual demonstration of the fact that even only one ounce of pressure exerted upon the teeth of a child will cause his teeth to grow into almost any desired position or direction, provided this small amount of energy is exerted over a period of months. We have seen the skillful orthopedic surgeon apply mechanical influence to tissue, thus causing long bones to lengthen and the soft tissues to grow right along with them. We have seen clubfeet made straight. We have also observed in moving pictures the ears of native African women lengthened more than a foot by having a weight attached to them for months or years.

These are not pointed out here, however, as new thoughts. It has been only within the last few years that orthodontists as a whole have realized how important to their work is this biologic phase.

Much has been said and written in regard to diagnosis, and the importance of it in malocclusion has been definitely stressed and discussed. Various and sundry elaborate diagnostic theories have been developed and coordinated to provide a better "yardstick" for diagnosis in malocclusion and facial deformities. As to whether or not these various diagnostic theories which have been advanced are important or unimportant, there seems to be a wide divergence of opinion at this time; however, we shall no doubt finally emerge from this confusion.

Probably as a result of the momentum of thought, which I have already mentioned, and its resultant transition of perspective to our problems, there can now be noted a definite trend to more or less ignore, to pass off with a mere gesture, the significant importance of mechanical technic and dexterity as highly important and necessary adjuncts in the treatment of malocclusion. It seems, therefore, that at the present time there is some danger of this trend of thought extending its influence to the point of unbalance. It is true that we are dealing entirely with a biologic matter; nevertheless the profession needs men who are able to devise delicate mechanical contrivances which can successfully direct the growth of osseous tissue, which are constructed so accurately and are applied so skillfully that the operator knows exactly what he is doing at any and all times, that he has the mechanical situation well in hand, that his mechanical interpretation of a biologic matter is based upon mechanical accuracy, upon mechanical dexterity and skill rather than upon a hit-and-miss method. The work of such men is still in tremendous demand.

Let us not make the mistake of treating our mechanical problems in orthodontia as purely a necessary evil, because even in the present stage of orthodontic development, notwithstanding everything else that we may or may not know, we do definitely know that maneuvering wisely with appliances will in most instances correct malocclusion, move teeth and cause bone to grow. We also know that in most instances when function and forces of occlusion are well understood these corrections will usually remain.

The biologic and the diagnostic slants to our problems are highly important, but there is another thing that to me is just as important, and that is mechanical dexterity. This dexterity has not yet gone very far in its development, and it will be interesting to note its improvement in the next ten years.

Howard's work in endocrinology, bone growth, nutrition, and calcium metabolism seems to be quite generally agreed highly important to orthodontic problems. This work has introduced a new contributing influence and has given a broader and more rational scope to our work. This, however, does not change the fact that osseous tissue and soft tissue respond in a very satisfactory way to mechanical forces, applied in an accurate, painstaking and delicate manner.

The confusion which now exists in regard to the mechanical means of correcting malocclusion—for there is a vast array of appliances and methods from which to choose and all of them strive to accomplish a common purpose—is largely a result of intolerance of the other groups, methods, and ideas. The shortest, quickest, and simplest ways and means to the end, from a mechanical standpoint, are the goal toward which all orthodontists are working. Excellent results have been obtained in the hands of various operators by the lingual technic, by the Angle ribbon technic, by the removable appliance technic of years past, and, in fact, by all technics which have reached any degree of popularity among experienced operators. The fixed removable appliance which will be shown in the slides that follow is only another appliance incorporating the mechanical principles of practically all devices which have gone before and of those which are still quite generally used in the correction of malocclusion.

(Slides were shown of the technic of the fixed movable appliance.)

THE ENDOCRINES AND THE TEETH*

By J. S. Lankford, M.D., San Antonio, Texas

IN DISCUSSING this subject, it seems best to outline briefly the influence of each one of the endocrine secretions in forming the body and the mind, and then to follow with a discussion of the results of abnormality, some generalization concerning the effects of glandular secretions upon dentition, and then specifically the influence of each gland upon the evolution and further history of the teeth.

Body, mind and personality itself are the creation of the internal secretions. Height, weight, figure, form of head and face, beauty or ugliness, size, and shape of bone, and the character and quality of the teeth, all depend upon the internal secretions. Not only the mind, but all the riches and glories of the great and lovable soul come from the same source; and nearly all warp and wickedness of character and much insanity and crime arise in the endocrines.

The history of the evolution of each tooth in the growth of the follicle, the pulp, the cementum and peridental membrane, the tooth complete, is one continuous effect of the influence of the endocrine secretions from the early embryo to birth and through adolescence. The interrelationship of the different secretions is a powerful factor in the formation and stability of normal teeth. If the secretions are perfectly balanced, the teeth will be well formed and serviceable. If one gland is predominant, the teeth will conform to that particular type. If one or more glands are deficient in function, there may be early and important decay. The thyroid and thymus control the first dentition, and the pituitary and thymus the second. But there may be many departures from the normal and many mixed results. Individual peculiarities of the teeth are never accidents but are always glandular. Pituitary difficulties lead to crowding and deformity, and thyroid and parathyroid deficiency to early decay. Dental variations are always due to endocrine influence, whether it be in size, shape, position, color, stability or a tendency to decay.

The thyroid personality is keen, alert, energetic, active, alive, the doer in life. Limited secretion makes an ineffectual character, lazy, and inactive physically and mentally. The interspaces between the brain cells are edematous and clogged, and nerve impulses are impeded. The mind is dull, sluggish, and not infrequently there are lapses in thought and various uncertain mental states. The functions are poor. Basal metabolism is low. This condition exaggerated becomes myxedema with the thick, rough, swollen skin, the enlarged cervical glands and very low mentality. The patient is incapable of initiative or action. An extremely small amount of this

*Read before a joint meeting of the San Antonio Dental Society and the Southwestern Society of Orthodontists, San Antonio, Texas, Jan. 8-10, 1931.

secretion results in forming the cretin and the idiot. Marked overaction, too much secretion, may touch the region of delusions and hallucinations and even crime. In the thyroid type the teeth are small, regular, pearly looking, and glistening and stand wear very well if the thyroid gland is functioning normally. If there is marked insufficiency, they are subject to decay, and the patient is dull, neglects his mouth and pyorrhea is probable.

No endocrine gland is of greater importance in relation to the teeth than the parathyroids, for they govern the utilization of calcium in the making of bone and teeth. These children or adults in the normal have big bones, strong muscles, calm nerves and are usually happy. Insufficiency is recognized by irascibility, restlessness and discontent. This secretion maintains calcium metabolism, favors bone making and the natural evolution of the teeth. It also destroys various poisons that get into the blood, and when functions are poor, these poisons not merely irritate the nerves and disturb the mind but may even cause convulsions. When function is poor and calcium deficiency is marked, there is a strong tendency to carious bone and teeth. The teeth of the subparathyroid always give trouble.

The suprarenal glands mark and temper the strong personality, the energetic man. The secretions of these glands maintain body temperature, blood pressure and favor good function and strength. They stimulate the thyroid and thus aid in activating the brain. It happens, therefore, that underfunctioning leads to asthenia and to low functioning power of the brain; the blood pressure is low; the patient is neurasthenic, weak, nervous. The suprarenals are the glands of emergency. Mentally we live upon this secretion continuously in fighting the battles of life. Inaction or poor functioning power causes physical and mental exhaustion, and we have not the power to think or act. Extreme overaction may lead to anger or high temper to the point of murder. The teeth of the adrenal type are well developed, strong, flinty, inclined to be yellowish in color and usually have good resisting power. The size of the canines especially is determined by this secretion, and many a man bears the marks of long-gone fighting ancestors in his fangs. These teeth resist decay very well.

The pituitary gland has most to do with the growth and proper development of the mechanism of the mind as well as the body and shapes the teeth in a particular way. Many of these patients in the abnormal suffer from violent temple and brow headaches on account of pressure upon the pituitary body in its bony case, the sella turcica. The secretion from the frontal lobe energizes thought, stabilizes judgment. The secretion from the posterior part regulates the water balance of the body and maintains weight at the normal, and in addition to that it plays upon that mysterious instrument that lies around the base of the brain, the center of sensation and emotion, in normalcy running the whole gamut of the sweetest emotions of life. When deficient or vitiated, all is discord. Herein lies the most vital center of mental aberration. In man the anterior portion is dominant in life; in woman the posterior. Men are governed by aggressive force and intellect and sometimes think that they are more intelligent than women, but that is not necessarily so. The secretion of the posterior part of the gland plays forcefully upon a wom-

an's life, and she lives in the emotions. Her brain and thought are of a finer and more delicate quality, but she is none the less capable if less strong. In deficiency the sex organs are infantile; the figure is decidedly feminine; the mind is dull. The high class pituitary character is the thinker, the philosopher, the inventor, a man of great achievement when the other internal secretions are normal. This is especially true if his life is dominated by the anterior pituitary so that he is not governed too much by the emotions. If there is a syphilitic strain in the inheritance, the sella turcica may be small or deformed, cramping the pituitary body, and there is an eternal fight against the rules of society. Abnormal impressions are carried into the emotional centers, and the boy cannot interpret his environment with his mental equipment. Just laws do not fit his yardstick. He lies; he steals; he makes no progress in school. He is deceitful and grows up to uncertain citizenship. He becomes a chimerical schemer, a check artist, a perjurer, always in conflict with society. The cure of a case of this kind with glandular treatment is one of the most dramatic miracles in medicine.

The teeth of the pituitary character are large and square, especially the central incisors, and they are particularly prone to be irregular and crowded in pituitary difficulties. These teeth stand service well, but they may be very ugly in their deformity and crowded condition. By far the largest part of the orthodontist's work is in this sort of mouth. The circulation in the gums is poor where the teeth are crowded, and the gums are much disposed to disease.

The thymus type in the male is feminine in form and character. In some cases the patient is marvelously artistic. Raphael was an example. If the thymus is persistent in part, sexual life is limited or perverted, and there is a strong criminal tendency. The teeth in the thymic are milk white and crescentic on the grinding surface, are somewhat fragile and do not hold fillings and bridges very well. The gums follow the teeth in disposition.

The liver is a great endocrine gland. Among its many functions, it may fail in its all-important work of detoxicating the poisons that come from the intestinal tract. The patient is heavily toxic and much inclined to pyorrhea, beginning in intestinal autotoxemia. If the liver is very poor in function, the sufferer is stupid, inclined to melancholy and neglects his mouth. In the main the teeth are not especially influenced in formation, but the gums are much disposed to pyorrhea and the teeth to apical abscesses, which threaten the gastrointestinal tract, the heart, kidneys and other organs. Here the dentist can render the greatest possible service by that complete correction which will prevent disease.

The gonadal secretion is of tremendous importance in stimulating general virility and in preventing disease of the gums and teeth. In the development of the body it is this secretion which controls the depth of convolutions, thus increasing brain capacity. When the secretion is limited, there is general lack in mental activity. The gonadal character in the normal is highly efficient, even though he is possibly somewhat irregular in morals. He is well balanced, virile mentally and physically and molds life largely by his own patterns and succeeds in what he undertakes because he has power and

creative genius. Limited secretion of the interstitial cells limits life and reduces it to the mediocre. Abelard, the most brilliant scholar of his time, was brutally castrated for his passionate love of Heloise, and he was immediately reduced to the ordinary and never accomplished anything afterward. No eunuch ever attained distinction in art, science or literature. Woe to the individual and to society if this secretion is at an extremely low point or vitiated. In this class are found not only the crimes of sex, but horrible cruelty and vicious mutilation in murder; the crimes that reach the torture and depravity of the damned of earth. This secretion very generally stimulates all the endocrines and leads to the formation of good sound teeth, but when there is insufficiency the maxillary teeth are likely to be small and irregular with some of the lateral incisors stumpy or turned in awkward directions and there may be some missing. It might be said in general that well-balanced functioning power of all the endocrines tends to the evolution of fine normal teeth and to their good service and preservation.

It has seemed well to describe the various types of personality as to the body and mind created by the various internal secretions and abnormal conditions; thus presenting the medical side, and then to discuss in relation thereto the influence of the secretions of each gland on the formation of teeth and their preservation or carious state.

The relationship between the endocrines and the teeth is extremely vital and important, and the departures from the normal are easily determined. It was thought by presenting the matter in this way that dentists might not only understand the relation of the endocrines to the teeth in normal and abnormal conditions, but also recognize the medical side, especially in deficiencies, and advise well concerning restoration to health.

Let it be emphasized that pituitary difficulties create the abnormalities that call for the orthodontist's service; that active pituitary, thyroid and thymus secretions are very important in the evolution of good sound teeth; that good, well-balanced, suprarenal, thyroid and parathyroid secretions are strongly inclined to maintain good healthy teeth and gums; that by far the greatest cause of caries is insufficiency of the thyroid and parathyroids; and finally that on account of the intimate association of all the glands in their work all must be considered in diagnosis and treatment.

Infection from the mouth is one of the greatest of all causes of organic disease, and the dental profession is a mighty power in disease prevention. The association and cooperation of dentists and physicians should be so close that they should be considered one great profession, making every possible effort to care for the mouth and to protect the health and happiness of the individual and to conserve the interests of the public health.

WHY THE PUBLIC KNOWS SO LITTLE ABOUT ORTHODONTICS, FROM THE VIEWPOINT OF A PUBLISHER*

By Dr. C. V. Mosby, St. Louis, Mo.

WHEN one becomes acquainted with the background of a problem, the solution of the problem involved is made possible. A conception of the reasons why the public knows so little about orthodontics makes necessary the bringing forward for review the high lights involved in a study of the background of orthodontics from its birth to the present time.

We are attracted to objects and things in accordance with the appeal that is made to us by the objects and things to be studied. For an object to appeal to us we must first of all understand the object, and it must interest us because of its ability to give us personal pleasure or profitable gain. Reasoning from these two premises we ask:

1. Does the public understand the meaning of the word "orthodontics"?
2. Does orthodontic service make an appeal to the public?

The first of these questions can easily be answered in the negative. Prove this by the following experiment. Take any mixed group of ten to fifty persons. Ask them one at a time or collectively to give you the definition of the word "orthodontics." You will find less than one per cent familiar with the word, unless there are in such groups children, or the parents of children, who are under an orthodontist's care. Ninety per cent of all adults have the mind of a fourteen-year-old child. In making appeals to people such appeals must be simple enough to be understood by a fourteen-year-old. This is the reason that national advertisers make such studied efforts to present their message to the public in the simplest manner possible.

Jingles and rhymes written around kewpies have made Campbell's soup known to most of the one hundred twenty million people in America because the appeal made is couched in such simple language that a child can understand it. If the manufacturers of Campbell's soup had presented their message in technical language only, telling about vitamins and the vitamin content of their soup, little if any progress would have been made in getting soup sold.

Pepsodent is a household word in American homes because the youngest child in the home can listen in on Amos and Andy's daily chatter and understand it. With this understanding as a basis, the sagacious manufacturers of Pepsodent unlock the public mind and tie in this understanding with the announcer's statement about Pepsodent.

You cannot impress your listeners with your message unless your listeners can understand your message. It is unfortunate that orthodontics is so difficult for the average mind to comprehend, but time and well-directed

*Read at a meeting of the Southwestern Society of Orthodontists at San Antonio, Texas, January 7, 8, 9, 10, 1931.

efforts can overcome this handicap. Orthodontics is no more mysterious to the average mind than was halitosis, but halitosis, bad breath, is known and understood by most magazine readers because the manufacturers of Listerine prepared a background for its being understood. Orthodontics—the correction of crooked teeth—is no more difficult to understand than halitosis—fetid breath.

Another factor that contributes to the laity's lack of knowledge of orthodontics is the attitude of the dental profession. From an experience based upon twenty-five years of close contact with dentists, I know that there are ten dentists either antagonistic or indifferent to orthodontics to one that is a friend of and booster for it. Possibly you may wonder why this is true. Here again an understanding of the background of this problem will afford an answer.

Dental colleges, with few exceptions, are giving and have given inadequate courses on orthodontics. As a result of this, students graduate in dentistry with little inclination to do orthodontics, and with little or no desire to tell their patients about it. For these reasons there is a lukewarm, lackadaisical attitude on the part of the dental profession toward orthodontics.

Dentists look upon most orthodontists as upon an octopus with long grasping arms and eyes located in various parts of his head, ever looking for well-to-do patients from whom they can extract the largest possible fee. The first time I ever heard the word "orthodontics" spoken was in St. Louis more than twenty-five years ago when a dentist remarked to me that Doctor Angle was the biggest grafter he had heard of because he had just charged $1500.00 for straightening the teeth of a child in the X__ family (one of the wealthiest families in St. Louis). This was my introduction to orthodontics, and it was given by a dentist.

Dentists should be the bearers of good tidings to the public about orthodontics. By this method the gospel of what orthodontics really is, what it can do for child life, and what it has done for child life, can be more effectively carried on than can possibly be done by any other method; unfortunately, however, this great avenue is closed.

Dentists have heard much and read much about the dissentions that have so often torn asunder the ranks of othodontists. These conditions have made them smile and give utterance to the old adage that "When thieves fall out among themselves, honest men will get their just dues."

As a result of the attitude of the dental profession toward orthodontics, due to bad psychology, the dentists themselves stand as a barrier against the understanding of orthodontics by the public.

Good will is one of the greatest assets that an individual, a product, or a profession can possibly have. Unfortunately orthodontists have not made well-directed, continuous efforts to build in the minds of the public an attitude of good will toward orthodontics. An air of aristocracy seems to have pervaded orthodontic sanctuaries. Its policies and plans have been made and directed by men who were too busy either with their own affairs, or with the politics of state and national bodies to give any thought to enlightening the public with reference to orthodontics and its service to society, and because

of this condition, enlightenment on the part of the public with reference to orthodontic service has been moving and still moves at a snail's pace.

Is orthodontic treatment a necessity or a luxury? Is it a service that is to be restricted only to those who are able to pay large fees, who appreciate the beautiful and the artistic in facial form and contour, or is it a service that should be available to the masses, just as medical and dental services are now available?

If, as a specialist in orthodontics, you believe it is a service that is to be restricted to the aristocrat, then to you it seems unnecessary for the public to know much about it, because the persons that you will serve are so few in number that a limited knowledge on their part will keep you busy. Does your conception of orthodontic service encompass all of humanity who need it or is it restricted to the number of patients that you can serve? If your conception is a restricted one, then you are not greatly concerned about spreading a gospel of understanding to the public, but if your vision of service takes in the small as well as the great, if the Lazarus as well as the Dives who needs your service appeals to you, then you are vitally concerned with the spreading of information about orthodontics, and you are vitally concerned with arriving at a correct answer concerning why the public knows so little about your specialty.

Organized dentistry has never, to my knowledge, made an effort to educate the public on any important subject related to dentistry. In this it has been different from the medical profession. The public today is well informed on many matters that deal with public health. Two of these, the care and feeding of babies, and the cancer problem, are thoroughly understood by the public, because organized medicine through its national societies and through health journals which it controls, as well as through lay magazines, has seen to it that educational work along these lines has been done. Furthermore, organized medicine through its national headquarters in Chicago broadcasts health talks four evenings each week.

Figure out for yourself how long it would take for the public to know something, at least, about orthodontics if once each week, or even once each month, a fifteen-minute talk were put on the air from the *National Dental Journal* headquarters in Chicago, telling people everywhere about orthodontics, and suggesting that mothers who have children with malocclusions go to their dentists and talk the situation over with them.

Another effective way of reaching the mother and father is through the lay magazines, especially women's magazines. If the orthodontic profession will have some of its leading members write educational articles for journals with tremendous circulation, such as "The Woman's Home Companion," "Good Housekeeping," "The Ladies Home Journal" and "Delineator," the mothers and fathers of the American children will be reached. Men and women both are eager for information concerning child health and welfare. After studying these articles devoted to the welfare of children's teeth, nutrition, and occlusion, they will look more closely at their own little boys and

girls and will realize the handicaps under which they are developing. These fathers and mothers will seek out the orthodontist for the benefit of their children.

Don't you think that constructive work of this character is well worth while? Don't you think if organized medicine can see fit to fill the pulpit in every church in cities where it holds its annual meeting with a doctor the Sunday night before the annual meeting is held, beginning the following Monday, and have this doctor talk on some health topic, that the National Dental Society can very well follow this custom and tell the public some of the things that they should know about dentistry and its allied special branches? If such a plan were adopted and followed out carefully, you would see interest in orthodontics on the increase. You would see an intelligent understanding of orthodontics by the public.

CONCLUSIONS

In making a survey of the situation concerning the lack of information about orthodontics on the part of the public the following causes are noted:

1. The difficulty encountered by the average mind in understanding the meaning of the word "orthodontics."

2. The specialty itself makes an appeal more to the aesthetic sense of the patient needing orthodontic service than to the utilitarian sense or the desire for gain.

3. Lack of proper training in orthodontics by dental schools and consequently a lack of interest in the subject by dentists.

4. A spirit of actual antagonism among dentists toward orthodontists.

5. A tendency toward aristocracy on the part of the orthodontist.

RECOMMENDATIONS

It seems to me, in making a study of this field, that the following recommendations might well be considered by orthodontists and orthodontic societies:

1. That well-directed effort be made to have more time given to teaching orthodontics in dental schools—to make it a major subject on the same footing with prosthesis, operative dentistry, and crown and bridge work.

2. That one or more papers on orthodontics be read at all state and district dental meetings. In this connection it might be well to suggest that recognized orthodontic societies see to it that a certain amount of educational work is done continuously in their territory among the dentists, in order that a more friendly attitude be created toward this specialty.

3. That the national orthodontic society endeavor to interest the National Dental Society in establishing a health program to be carried to the public by speakers both before audiences and over the radio, and that due consideration be given orthodontics in these programs.

4. That the public be reached through articles in the lay journals.

THE TECHNIC OF RESILIENT ARCH ASSEMBLAGE*

By Edward M. Griffin, D.D.S., New York, N. Y.

I DO not claim to be the inventor of any appliance, nor shall I announce the arrival of another "latest and best" in orthodontic mechanisms. Rather, I shall embrace this opportunity of speaking before you with a presentation of fundamental principles of tooth movement in the light of the mechanical principles which may be employed, as they affect the metabolism of cellular structures.

When you observe the variations of appliance design to meet the requirements of individual cases in the application of resilient arches to be shown in the clinic at this meeting, I am certain that you will note that an appliance may be almost as varied in design as the conditions which malocclusion may present; nevertheless, the fundamental principles of assemblage, as I have for many years applied and studied its efficiency, is offered as a distinctly unified technic.

While I would much prefer to avoid a personal allusion, I feel that it is necessary for a proper understanding of my views concerning the subject which I am to present. It is for the very purpose of avoiding the egotistical strains which have so dominated presentations concerning orthodontic mechanisms, that I wish to explain my position personally in discussing this subject.

First of all, may I state that I am independent in the field of orthodontia, so far as actual graduation from any school in orthodontia is concerned. I secured my initial orthodontic training from private instruction in the practices of Angle graduate practitioners. Following that, I come from the school of experience and close association with practitioners from the Angle, Dewey and International schools of orthodontia as well as with practitioners from other sources of training.

I present this subject as a fellow-practitioner and clinical teacher, first, from the standpoint of a practitioner, as one who has been striving for the past twelve years in the practice of orthodontia exclusively, to give mechanics the proper proportion of attention as related to the subjects of biologic consideration, but one who has been constantly dissatisfied with the mechanical features which the leading types afford, at the same time fully cognizant of the fact that all endeavors in the orthodontic field converge "to assist nature in the development of a masticatory apparatus which constitutes an assemblage of parts best suited to the functional activities of the organism as a whole," as expressed by Dr. A. LeRoy Johnson.

In my references to specific types of appliances which are in vogue, please consider them for the purpose of constructive criticism as well as commendations of various features involved for the sake of clearness in explaining why

*Read before the Alumni Society of the Dewey School of Orthodontia, New York City, October 27, 1930.

I believe thoroughly in, and personally use, as well as teach, the use of the light resilient arch assemblage. I shall therefore assume that while individual members of this society may feel decidedly partial to certain types of appliances, I have the highest respect for this opinion, and I realize that splendid work is being done by any type which may be used in the hands of certain individuals. In the final analysis the mechanisms employed are but instruments in our hands, and the results of our work are largely reflected as the ability of the operator because the operator is "the man behind the gun," he animates the mechanism, and yet, I believe that a progressive surgeon would be constantly interested and observant of designs in the instrumentarium which might prove more serviceable in the performance of his operations. I shall assume further that the members present are in mood with an open mind to consider the subject in the light of fundamental mechanical principles as they should be applied in accordance with the biologic consideration that we are dealing with living tissues, irrespective of the inventor or sponsor and irrespective of what we may or may not be using; to give merit or demerit according to a judgment concerning the principles involved.

Second, from the standpoint of the teacher, I shall ask that you place yourself in the position of the graduate dentist today, aspiring with enthusiasm to give serious attention to the practice of orthodontia. The progress of members entering the field is offered for your consideration, and herein, I feel that I should meet a "sympathetic ear" because I have always had the greatest respect for the Dewey School of Orthodontia from the standpoint of presenting various opinions and of giving credit where credit is due with the thought in mind of weighing in the balance the virtues of each.

Orthodontia is a science and an art which is passing through the stages of growing pains, and it is at present in a state of flux. Recognized thinkers of the specialty are advocating views regarding diagnosis that are so diametrical that the very fundamental principles are in dispute. How it is possible for one group to set itself up as an examining board for state licensors or for judging the qualifications of another group as to fitness to practice *correctly* the specialty, when procedures are not standardized or generally accepted, is in my opinion, a questionable undertaking. This state of flux, likewise, involves the question of appliances, the dispute involving their comparative efficiency, the rôle they may play concerning resorptions, their influence upon the metabolism of cellular structures, the proper rate of tooth movement, the speed of treatment, the proper degree and type of pressure, whether further designs can possibly aid the specialty; what is the relative degree of importance of mechanics as compared to biologic studies, etc. While disagreement prevails concerning the appliance which should be used, nevertheless, a promising indication does seem to have appeared, namely, that regarding the nature of proper stimulation from a mechanical standpoint it should emanate from the mechanism as a light, even continuous pressure with reservations as to the possibility of producing such a type of pressure within practical limitations.

The employment of small gauge wires for the application of light pressure is no innovation in orthodontics. The desirability of providing physiologic

growth as the result of mechanical stimulation during treatment has decidedly augmented the trend toward delicacy in appliance construction. Many operators now employ small gauge auxiliary springs and small gauge arch wires as accessories to appliance constructions of various types.

The technic of employing small gauge round wire arches in conjunction with a fixed attachment, which renders the arches themselves as active functioning units for the delivery of spring pressure in the form of a comparatively standardized technic to be used throughout the treatment of various types of malocclusion, is creating greatly increased interest among members of the profession. In response to numerous requests during the past ten years for an adequate elucidation of the fundamental principles of the technic of light, resilient, arch assemblage, particularly as I have presented in numerous clinics, a treatise entitled, "The Technic of Resilient Arch Assemblage," has been recently written, to which I refer you for additional information relative to this subject, since this presentation must necessarily be limited.

I venture the opinion until such time as research may reveal those truths and until the laity shall have become so well educated and observant of the advantages of preventive measures that the orthodontist will rely chiefly upon instruction regarding prenatal care, dietary measures, the normal function of the endocrines, the employment of exercising muscles to serve as "living appliances," etc., to supplant the present fact that mechanics play an important rôle in the treatment of malocclusions; that until orthodontic mechanisms shall be much less the integral part of treatment through their application manifested by the fact that bone does develop in response to mechanical stimulation, so may it be assured that advancements shall continue to be made in the mechanics of appliance construction to conform with the newer science known as biomechanics.

The opinion is further ventured that with such advancement will come increased standardization in the technic employed by the successful operator for the reason that he will desire the cultivation of that particular skill which is attainable through prolonged experience with standardized methods. The very nature of the biologic problem involved in treatment shows that the same fundamental physiologic and mechanical principles can be satisfactorily applied to stimulate cellular activity in the treatment of all cases.

The current belief that radically different types of appliances are necessary to treat different types of malocclusions, or that it is expedient to employ a wide array of assemblages to produce particular tooth movements, means, in my opinion, that the respective mechanisms are narrow in their scope of action and application, and that an advancement to aid the operator, concerning simplicity in construction and his ability to develop increased operative skill, would result in the employment of a technic which combines as far as possible the respective advantages, but likewise eliminates the disadvantages of each. Such a development in mechanics should continue to contribute to the advancement of the specialty in no small degree, concurrently with various branches of research. It challenges the utmost ingenuity of those technically inclined individuals who strive to advance the science and art of orthodontia from this standpoint.

It is needless to say that many refinements in assemblage will continue in development, but this technic does represent my efforts during several years of well-tested application, and it is offered as a contribution toward the heights of efficiency and satisfaction which may be attained through the operation of mechanisms upon the teeth.

The light resilient arch used with the Griffin attachments offers the following salient features:

(1) The elimination of *rigidity* in appliance construction; and the employment of a light, even, continuous pressure which is transmitted from the initial moment of setting and is continued for a considerable period of time, either over the entire arch or over a limited area. The control of slight physiologic stresses through the application of elasticity of flexure or the elasticity of torsion to accommodate the range of tooth movements and stimulative reactions required in the treatment of complicated orthodontic conditions.

(2) The assemblage of appliance construction to safeguard the vitality and roots of all teeth; in regard to the anchor teeth, the distribution of pressure in group anchorage by arches functioning under adjustments with a minimum of pressure to minimize danger of resorption from a mechanical standpoint.

(3) The advantages of minimum bulk of material not interfering in labiobuccal arch application with the cheeks and lips, or with the tongue and musculature in lingual arch construction; the desirability of thus combining arch construction or using each independently at intervals; the comfort and compactness commensurate with small-gauge construction, particularly the slight area of small-gauge round wire metal in contact with enamel surfaces, making the contact safe to tooth structure and leaving no cause for the use of bands except where they are needed as terminal supports.

(4) The appliances permit of thorough cleansing daily by the patient, and the mouth may be kept in a satisfactory hygienic condition. Arches are of fixed removable type; removable only by the operator, but readily so for adjustments and prophylactic treatments.

(5) The adjustments are not exacting; the resiliency of the arch permits considerable latitude within the attachments for adjustments and easy adaption to the inequalities as outlined by the surfaces of the teeth in malocclusion.

(6) The adjustments are made with the positions of the counterparts of the attachments in the passive state, i.e., there is no uncertainty concerning the direction or the amount of pressure which will be exerted upon the teeth to be moved after locking the attachment. The definite nature of the change may be tested before locking to place, as we know that the similar opposite reaction will be exerted after locking the block in the seat. The changes in position are effected through the elasticity of flexure and the elasticity of torsion, according to the nature of the adjustment which involves the locking and unlocking of the attachment. The bodily root movement of teeth is thereby controlled.

(7) The design of appliance construction may vary from the simple to rather complex forms, according to the nature of the corrections to be made and the severity of the case. The design should be changed occasionally, ac-

cording to the requirements of the case as changes occur during treatment, thereby maintaining at all times the simpler construction and minimum bulk of material in the mouth.

(8) The construction is entirely of precious metals. Difficulty in soldering because of oxidizing surfaces and liability of burning the appliance during construction are practically eliminated. A cone flame from a small orthodontic gas burner is sufficient for soldering.

(9) The technic of assemblage and construction is simple, as shown in the following directions and illustrations: The attachments are accurately made and the parts are interchangeable. The construction may be done directly in the mouth or as laboratory work from casts. There is no necessity for investing in repairs or original construction. A little practice in free-hand soldering is the prime requisite. The attachments may be expeditiously locked and unlocked if directions are followed and the proper instruments used. Aside from the arch wire itself, the remaining vital part of the appliance is necessarily some type of locking device in order that the pressure, having been made during the adjustment, in degree and direction as desired to produce the proper stresses, may be maintained under the tension set to produce a continuous action until the energy of the force is spent. It is necessary, if the maximum efficiency is to be obtained in a practical way with small gauge wires, that such a locking device must possess several mechanical features. These mechanical features will be considered in a later section of this paper.

Vital considerations involving physiologic factors and mechanical principles are offered for your consideration: Granted that a light, even, continuous pressure approaches the ideal in physiologic stimulation from a mechanical standpoint—what are the mechanics involved in a mechanism which will deliver such a pressure with ease of adjustment to the operator?

First, it must be understood that no mechanism, applicable upon the teeth, can produce a pressure which is truly even and continuous. The reservations of these terms for practical applications means that the pressure simulates that which is transmitted from the mainspring of a watch wound under recoil, to the mechanism. The pressure is necessarily diminishing in an orthodontic mechanism and cannot be maintained evenly until the force is entirely spent. However, it is possible with a light resilient arch, which is in itself the power unit of the appliance, to apply a pressure which is light at the initial moment of setting and which will continue with gradually diminished strength to exhaustion.

Such an arch is an elastic one, functioning at every point in its length of application. The arch functions when it is locked in position, under compression which is produced by the general bowing action of the arch wire as well as that produced at the loops by gradually opening or closing them during adjustments. It is secured accurately in position by intervening, fine alignment hooks soldered on the bands at well-distributed points between its terminals. The light resilient arch, being nonrigid, is made to conform to the size and shape of the dental arch as it is found in malocclusion. It is so flexible that it can by repeated adjustments, during treatment, be conformed to the ideal as conceived by the operator. It may be adjusted so that it will

be effective on the teeth throughout the length of the arch for a considerable period of time without exerting more than a slight pressure. It may be adjusted so closely to the teeth in malocclusion that the forces of mastication do not punish the arch wires and thereby cause frequent breakage, in small gauge construction as might be expected. The small bulk of material is decidedly advantageous in the placement of lingual arches in occlusions of close-bite. The light resilient arch is applicable both in lingual and labiobuccal types used singly or in combination. The mechanical forces utilized during treatment should be in accordance with biologic and physiologic laws. While this principle has been taught with conspicuous consensus of opinion, it has been practiced with astounding inconsistency. I recognize the approaching ideal physiologic pressure which is exemplified in the auxiliary finger spring. I also believe that the fundamental principles of tooth movement as expounded by Dr. Mershon to be an outstanding contribution to modern orthodontics. In accordance with previous writings, I reiterate that it is my recommendation that the amount of pressure delivered to a tooth, from the initial moment of application, be limited to a few ounces of pressure; that the force should be

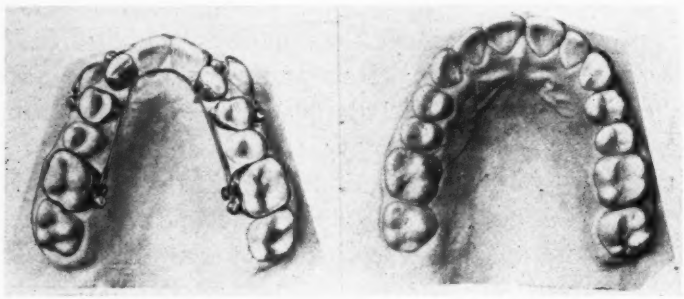


Fig. 1. Fig. 2.

Fig. 1.—A typical application of a maxillary lingual and accessory labial arch. The stabilizing wires terminate in tubes to permit rotation of the first premolars while they are in group anchorage with the molars. The stabilized groups swing in phalanx. The development is secured mainly by the lingual arch. The accessory labial arch is employed to give the proper axial inclinations in conjunction with the lingual arch, after considerable development has been secured.

Fig. 2.—The arch shown in Fig. 1, after development to the ideal as desired by the operator.

gradually spent over a considerable period of time between adjustments, that the tone of the investing tissues should be noted and irritation be prevented. That, also, in regard to the bodily root movement of teeth, the comparative safety of tooth structure is dependent upon the degree of rigidity offered by the arch wire itself where the fixed type of attachment is used; whether the forces applied through the attachment to it are excessive and the extent to which the teeth under attachment, during movement, are interfered with in their functional activity—that if these considerations are given due attention the comparatively fixed attachment may be employed with safety. Also, I wish to stress that interference with functional activity during treatment may result either from rigidity or from spring action which is improperly applied that the appliance should minimize immobility and mobility as far as is consistent with efficiency. It should therefore be evident that it is not necessary to employ a light free end auxiliary finger spring, or in contrast, a nonlooped

arch wire of considerable rigidity, locked in series at close intervals by fixed attachments upon every tooth banded, to avoid the aforesaid evils, respectively.

I offer for your consideration, a mechanical application in the resilient arch, which embodies advantages of each, but is essentially different, for the delivery of the desired type of pressure, with comparative ease in adjustment. The light resilient arch will deliver an auxiliary spring pressure against one or more teeth at any point within its terminals in response to an immediate adjustment at the point where the pressure is desired. There are no springs to be added or detached, as pressure is required at various points during treatment. The arch is essentially one large finger spring, but one that is positively controlled in position against the surfaces of the teeth. In the application of the resilient arch it is possible to apply a pressure so gentle that the patient is unaware of it, or to accomplish tooth movement so rapidly that soreness and irritation may be produced. The elasticity of flexure, as applied to an

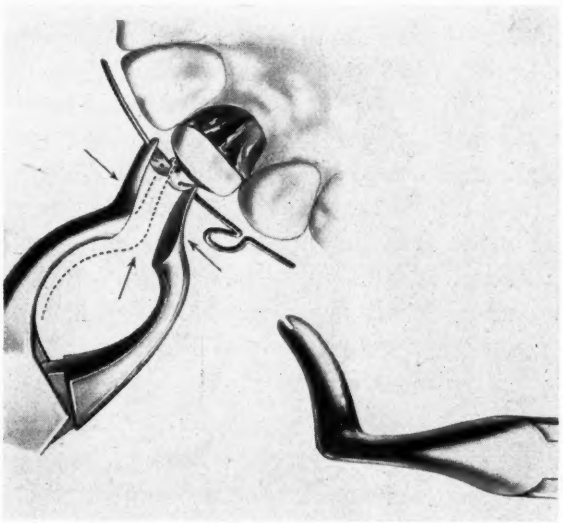


Fig. 3.—Locking the attachment with alignment pliers. The manipulation of the resilient arch is not exceedingly exacting. It presents no rigid or definite form, to be changed by an exacting adjustment to a slightly different form.

entire arch of teeth or the elasticity of torsion as applied to one or several teeth in bodily root movement is exhausted after about one month, when another adjustment is made, or rest periods may intervene. The combination of labial and lingual resilient arches readily admits of the application of the so-called "ironing out" principle on the malposed teeth, delivering the pressure bilaterally on these teeth without the necessity of many bands. Any portion and any number of attachments within one portion of the arch may be used for group anchorage in addition to that as provided for by stabilizing wires, while at any point in the remaining portion of the arch, the resiliency offers a ready means of adjusting a spring pressure on the teeth to be moved. The manipulation of the light resilient arch is not exceedingly exacting. The arch used in conjunction with the attachments as shown, presents no rigid or definite form to be changed by an exacting adjustment to a slightly different form as desired by the operator. When there is resiliency at every point in the arch,

it naturally lends itself to adaption to the malocclusion as it exists. Then, when adjustments are made to bring it nearer and nearer to the normal form, there is no sudden, exacting, or rigidly yielding and changed conformation of the arch thrust upon the teeth, to be moved. The adjustment as measured at the attachment varies from 1 mm. to 3 mm., as the seat rests passive out of the block. The block is sprung to position and locked with a light pressure from the moment of setting, and this is gradually decreased until exhausted.

Simple experiments which I have made with the technic show that it is only necessary to apply a weight to measure the spring force that we are using. By experiment with the pressure as I use it, if I open a loop of an 0.018 in. wire or 25 gauge, 4 mm., I shall produce or require a pressure of 8 oz. approximately. If I open a loop of an 0.036 in. wire, just twice the diameter, only a fraction of a mm., I produce a pressure of 8 oz. approximately. You can readily see that as we increase the gauge of the wire we produce a condition which makes the adjustment more exacting. That is the advantage of the small gauge wire and the employment of the proper size, shape, number, and distribution of looping within the arch wire for the maximum control of resiliency in adjustments to be made. Such design enables the operator to apply a light pressure over a considerable range of action on the teeth themselves and also have a considerable latitude in any adjustment of pressure to be made. The operator is not bound down to fine and difficult points of adjustment. The proper looping of the arch is exceedingly important. Improper looping may so weaken the arch that it will be rendered inefficient, and it may permit the jiggling action or continuous "back-lash" which is to be avoided, or improper looping may permit rigidity and consequently the delivery of a sudden excessive pressure upon the teeth at the moment of initial setting of pressure which is equally important to avoid.

The delivery of a light, even, continuous pressure from the standpoint of the resiliency of flexure has thus been explained, the same type of pressure as delivered by the elasticity of tortion for the bodily root movement of teeth is now offered for your consideration.

The elasticity of torsion is that force or power which is to be derived from the reaction to return to its original status, by virtue of the property of elasticity, to untwist after it has been twisted. In the application of this power, as in the application of the elasticity of flexure, an essential feature of the mechanism is the range of adjustment to be utilized in the production of a light force exerted at the initial moment of setting and the continuance of that force for a considerable period of time during the return to original status by untwisting. Here, again the operator should not be bound down to minute adjustments as pertaining to the number of degrees in arc of torque deflection, nor should the reactions in proximity to the adjustment along the long axis of the arch wire be a disturbing factor relative to the position of the approximating teeth as regards the consideration of anchorage.

The amount of force exerted at the initial moment of setting will be influenced in proportion to the coefficient of elasticity of the arch wire, in proportion to the number of degrees of arc deflection produced in torque adjustment; inversely proportional to the cube of the distance of the fixed attach-

ments or the terminals of the arch wire, bilaterally, from the point of adjustment, and proportional to the form and extent of looping or curvature along the long axis of the wire, within the area of adjustment which will, to a greater or less extent, lessen the resistance of the long axis of the arch wire to deflection by torque pressure, and thus the arc degree of deflection may be increased without creating excessive torque pressure. In the technic of resilient arch construction, the approximating attachments are never used as terminals to the torque adjustment. The pressure varies inversely as the cube of the distance; therefore, if approximating teeth carry the attachments, the rigidity as resisting the torque deflection is greatly increased and the operator is bound down to the difficult, slight twist adjustment. Also, if the course of the long axis of the arch wire is continuous and no looping or curvature is provided, the same rigidity is much greater than if such were provided. Also, the adjustment is rendered most difficult from the standpoint of anchorage if the anchorage is incorporated entirely within the long axis of the same arch wire, bilaterally to the site of adjustment, for as Dr. Angle explains with emphasis concerning the adjustment of torque in the "edgewise" arch quoting, "and it is to be distinctly understood that these bends must be made without in the least changing or disturbing either the horizontal or perpendicular planes of the metal arch anterior and posterior to them." May I herewith interpolate that had not Dr. Angle such an aversion to the use and virtues of some form of lingual arch which might easily be employed to serve in the problem of anchorage, he would not have found it necessary to make this adjustment so difficult because if the rebound forces of this adjustment were distributed through the adjacent teeth to a lingual anchorage, there would be little concern regarding the disturbance of the horizontal and perpendicular planes to which he refers. Dr. Angle further states, "The arch having been properly seated and the power made active, as directed, for the distal tipping of the teeth en phalanx, it should remain uninterruptedly active for two weeks. It should then most carefully be removed without disturbing its form, when the bends may be gone over and increased, extreme care being taken to make the increase very slight and proportional exactly to the original bends, the amount of increase not exceeding that which would be equivalent to the thickness of a piece of ordinary writing paper in any instance. Also, each individual increased bend must be compared with the angle of the walls of its respective bracket, as previously discussed, before the arch is again seated." Improvements may entitle the edgewise arch to be fitting the caption, "latest and best" so far as the Angle mechanisms are concerned, but here again the operator is facing the same unrelenting, exacting, hairsplitting adjustments.

The second vital factor which I offer for your consideration is anchorage.

Anchorage, in its true sense, does not exist in orthodontia. Millions of cells are always disturbed in any application of force, and it is the problem of the orthodontist to so assemble the forces that the resultant effects will produce a normal structure in development as he visualizes his case in the completed stage.

In the technic of resilient arch assemblage, the means of providing anchorage is particularly provided for. Efficiency of any mechanism is vitally con-

cerned in definitely controlled anchorage. In consideration of an important physiologic principle as expounded by Dr. Mershon, that we do not find rigidity or fixation in nature, it behooves us not to bind the teeth together in the form of applying a strait-jacket, so herein we are much concerned in the problem of anchorage. Some degree of binding action is necessary in providing anchorage, or undue stresses are liable to be imposed upon so-called individual anchor teeth. The resilient arch technic involves the construction of certain bands with attachments which may include stabilizing wires according to the requirements for anchorage. This constitutes the framework or base of the assemblage, upon which are locked in position, under tension, the small gauge resilient arches, separately constructed which constitute the active functioning units of the appliance to produce mechanical stimulation. If stabilizing wires are employed, they constitute separate wires, connecting such bands upon the teeth to provide for group anchorage, thus combining certain groups of teeth which may move only in phalanx, if perceptibly at all, during treatment, while the stabilizing wires connect such bands. The stabilizing wires may be soldered

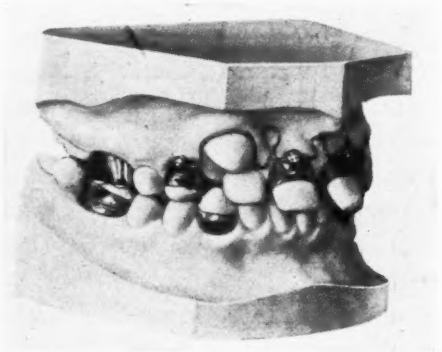


Fig. 4.—Shows application of the lingual arch employed to neutralize the rebound forces.

at each end to produce the stabilized unit. If the wire engages a tube at one or both ends, the banded tooth carrying the tube may be rotated during the movement of the group in phalanx, or a rotation alone may be effected. If a distal movement of the molar is desired slightly in advance of the premolars, a small open loop may be placed between the terminals of the stabilizing wire. If the molar is to be tipped distally in an adjustment of the occlusal plane, the distal terminal of the stabilizing wire may terminate as a hook and eyelet at the mesio-gingivo-lingual angle of the maxillary molar band. In certain cases the use of the lingual and labiobuccal arches together may, in connection with the attachments assembled in the alignment, provide reciprocal anchorage and no stabilizing wires be employed at all. The fundamental principle throughout is the construction which will provide group anchorage to neutralize or direct the resulting rebound forces of the adjustment to mutual advantage in the positioning of all teeth constituting the malocclusion. The action of the rebound forces is not similar to that which is found in the application of a base wire of heavy construction with auxiliary springs, nor is it confined to the remaining portion of the arch opposing the adjustment as in the Angle mechanism. It is possible to disturb the anchor teeth in any construction if

the pressure which is exerted as the opposite reactive forces is too great. It is essential that the stabilizing wires which provide group anchorage be employed during stages of treatment, which involves general developmental work and considerable bodily root movement, unless both lingual and labiobuccal arches are specially applied together to provide such anchorage. Thereafter, the use of the stabilizing wires may be discontinued and the finishing stages completed with the terminal anchorage teeth only. The illustrations show the construction of stabilized units and the explanation of the anchorage as pro-

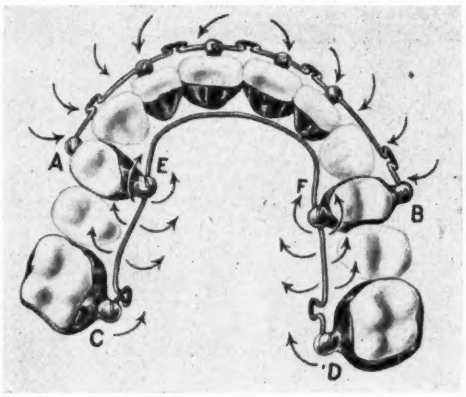


Fig. 5.—The premaxillary area requires extensive development. The application of torque pressure to move the apices of the maxillary anterior teeth labially and distally for securing normal position and inclination of the teeth sets up rebound pressure at the terminals *A* and *B* in the opposite direction, and it is transmitted to the secondary, lingual or control arch, at points *E, C, F, D.* The torque pressure is set in the opposite direction to that set up in the labial arch, thus preventing the crowns of the premolars and molars from becoming tipped buccally.

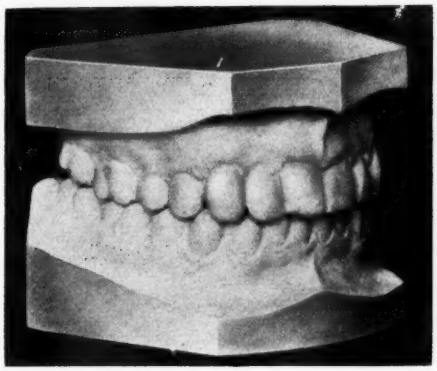


Fig. 6.—The completed case. The roots of the maxillary anterior teeth converged at the beginning of treatment. After development the completed case shows a complete reversal of their inclinations with a divergence of the roots.

vided in assemblage; they also illustrate the employment of lingual and labiobuccal arches pitted against one another in the control of anchorage; also the explanation of the lingual arch under torque pressure, serving as an active force unit, employed to neutralize the active forces, thereby distributing the reactive forces and neutralizing them through resiliency of its own substance instead of through the physical resistance of the tissues themselves. In other words, the reactive forces may be neutralized by the elasticity of torsion within the substance of the opposing arch itself, since the torque is set in the opposite direction. Since the reaction to the adjustment is controlled through a dif-

ferent arch than that in which the initial adjustment is made, the torque adjustment is thus simplified by the ease in control which is not possible when one arch only is employed.

Therefore it will be noted that in the resilient arch assemblage, the provision for anchorage which is intramaxillary in type is not employed as the plan of an anchor tooth, supporting the terminal of the arch, except that the assemblage may be reduced to this in the finishing stages when an arch is maintained in position for slight adjustments; rather, during the active treatment, anchorage is to be analyzed as the pitting of groups of teeth against

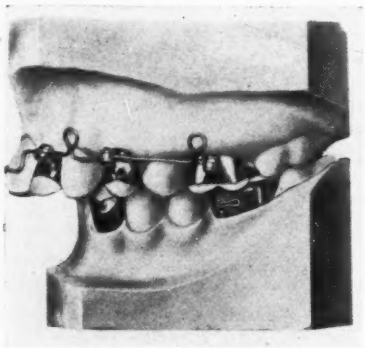


Fig. 7.

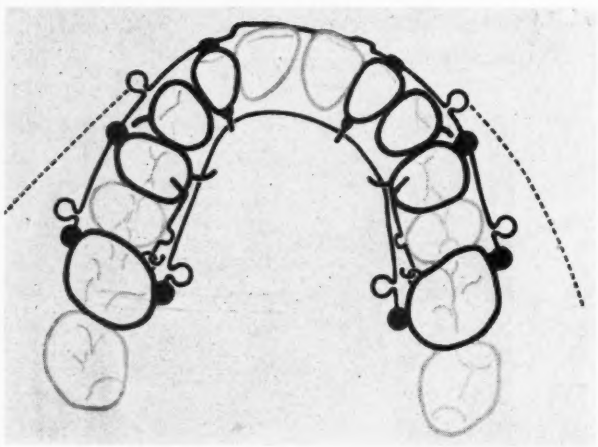


Fig. 8.

Figs. 7 and 8.—The resilient arch technic for tipping the teeth distally in Class II, Division 1 cases. The lateral and palatal views show the assemblage which provides for an adjustable group anchorage in which the premolars and molars are maintained in group anchorage. Provision is made by the hook and eyelet at the molar terminal of the stabilizer for the molars to move distally and to tilt backward and upward slightly in advance (by opening the loop) and independently of the premolars. Torque pressure is set in the arch terminals to tip the molars. First, the pressure is exerted distally, directly against the molars and second, to the premolars by leaving the buccolabial arch sufficiently loose so that it will not bind against the anterior segment as its intermaxillaries are moved from the loops over the canine area to the mandibular molars. The spikes are left out of attachments anterior to molar terminals to allow the arch to slide freely and to exert pressure as desired, directly to the posterior teeth. The spikes may be left out on molar attachments and inserted over the premolars.

other groups under the action of the active and rebound forces of the power units, i.e., the resilient arches, at the same time the movements of the teeth, being under control as they move both individually and in phalanx toward positions of normalcy, the respective groups serve as definitely controlled

stabilizing units in which the individual teeth are not bound in fixation but are successively moved within a millimeter or two latitude, succeeding each adjustment.

The third vital consideration is the type of attachment, its mechanical features, and the rôle it plays regarding the whole assemblage.

In my opinion, the "latest and best" of the Angle mechanisms shows a decided improvement in the feature of a locking device; however, the necessity of wrapping a ligature around the bracket with the arch wire in position to attempt prevention of the wire slipping through, as well as the prevention of its being pushed or pulled out, is here compared to the insertion of a pin, which securely fixes the entire attachment under tension. The mechanics offered in a horizontal bracket, that is, with the aperture which receives the arch wire, facing outward in a horizontal plane, should be very apparent as being particularly desirable since experiencing the difficulty which is encountered in releasing an arch wire from the locked to the unlocked position, unless the entire arch is removed from the attachments for its adjustment.

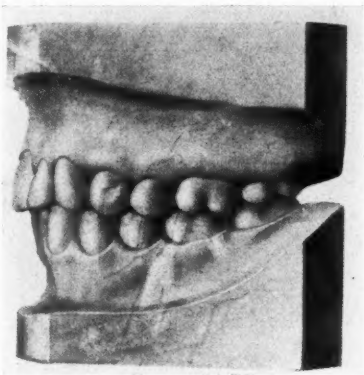


Fig. 9.—The completed case.

With the horizontal bracket the arch wire may not be distorted in making an adjustment while it is still locked in position bilaterally to the point of adjustment. Lifting the pin to disengage it from a tube or a vertical bracket is decidedly disadvantageous. As Dr. Angle realized only after several years of application with other forms of attachment, he recently wrote, "An open face bracket offers such mechanical advantages for conserving the elasticity within the metal arch while the arch is being adjusted, and for giving such complete control over the movement of individual teeth after adjustment that it should make a strong appeal." However, the horizontal bracket was presented by Dr. Ray D. Robinson of Los Angeles some fifteen years ago, so that feature cannot be considered new; Robinson also presented the important feature of having the arch wire pass through the entire attachment en masse The arch wire is thus aligned at right angles to the long axis of the tooth, and the force is transmitted equally from the center of mass of the attachment. This center of alignment and force emanation is important for the proper adjustment of pressure. The second principle is that the attachment involves the application of the elasticity of torsion for root control in the bodily

movement of teeth. However, the practical application of these principles and their proper functioning hindered by the lack of provision for efficient locking and unlocking, the lack of mechanical precision and refinement and features of mechanical weakness caused all operators to abandon the Robinson attachment.

I believe that the employment of the elasticity of torsion within the body of the arch wire, as emanating through its long axis and passing through the center of the attachment, to be the most efficient, from a mechanical standpoint of the various mechanical principles which are employed in the production of bodily root movement. Of course, the principle of tipping the anterior teeth by the reciprocal action of pressing lingually and labially upon the teeth with one arch placed high lingually and the other incisally is also employed to excellent advantage in connection with the torque application in the resilient arch technic.

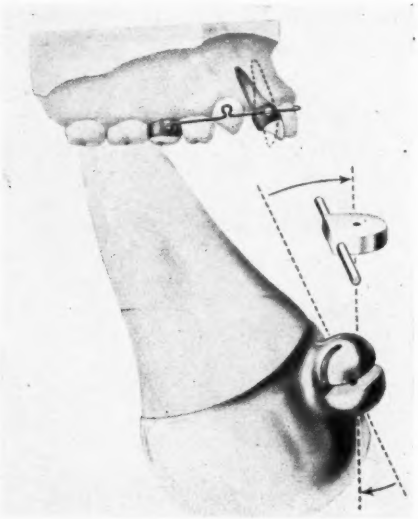


Fig. 10.—Shows the positive emanation of force from the center of attachment to a point near the center of resistance offered by the tooth within its investing tissues, in labiolingual root movement. Illustrating the elasticity of torsion. The aperture of the seat is at right angles to the long axis of the tooth mesiodistally and labiolingually. This center of alignment and force emanation aids the operator in the proper adjustments of pressure.

While a significant and true statement has been made by Dr. Milo Hellman that, "Teeth move in response to mechanical stimulation but not according to physical laws," and while our treatment, as aforesaid, should be in accordance with biologic and physiologic laws, and also while I do recognize that the general development processes of the maxillae show a tooth movement downward forward, and outward, in the maxillary teeth, and upward, outward, forward in the mandibular teeth, nevertheless, if I am desirous of producing development of a maxillary Gothic arch by means of mechanical stimulation, I do not care to wait patiently Nature's response in bringing out sufficiently the premolar and molar roots to their proper axial inclinations by the stimulation which is produced through a lingual arch with auxiliary finger spring application. I believe in the application of efficient mechanics to the teeth according to physical laws for results even if the teeth do not respond exactly as they

would were they moved through resistance mediums of definitely known, homogeneous, nonvital, comparative densities as might be demonstrated in a physics laboratory.

Concerning the mechanical deficiencies of the lingual arch to produce the tooth movements included in Dr. Angle's explanation of the three orders, the criticism seems well founded, but it is indeed weakened when he continues by saying that, "The lingual arch occupies a most irrational position in the mouth and this greatly restricts the operation of mechanics and interferes with the important functions of the tongue." Surely a fair statement here would be that it interferes with the tongue only to the extent as faulty construction and application would produce such a condition equally true with the size, the construction, and the application of a labiobuccal arch interfering with the lips and cheeks. Again, concerning the irrational position and restricting the operation of mechanics, this statement is difficult to understand from the pen of one who has written so extensively of biomechanics. What position can be as efficient for the emanation of pressure against the teeth for the development of an alveolar arch containing its dentition, as the expansive force of a lingually placed arch, pushing out to larger arcs in direct accordance with the direction of the natural developmental forces?

The range of action is much smaller than that of the labiobuccal arch positioned over the same dentition where the pull force is applied. The compressed action of the lingual arch seeking releasement by virtue of its resiliency, in which position the arch wire may exert pressure throughout its length in close adaptation to the surfaces of the teeth, is impossible to apply labiobuccally. If you will apply a resilient arch of like gauge lingually upon one case, and labiobuccally upon another, the cases being similar, you will note the superior efficiency of the lingual arch in expansion work.

Concerning the statement by Dr. Angle that, "The labial mechanism is in fact beneficial as a reminder to the patient in overcoming abnormal lip habits," it would seem unthoughtful that he did not suggest the possible value of the lingual arch to overcome tongue habits or the uselessness of Dr. Roger's "living appliances" for the correction of either.

The fourth vital consideration of mechanical principles in assemblage is: What form of wire is to be desired for ease of operation and uniformity of force control, the round vs. any flattened surface wire?

A significant statement regarding the arch wire form has been expressed by Dr. McCoy, "A round wire for the working portion is better adapted than one which is rectangular for reasons which are obvious to anyone who has studied the comparative uniformity of force control of the two forms."

It is equally significant that in the attempt to apply that form of arch wire which most adequately fulfills the mechanical problems involved, that the Angle mechanisms started with the round wire, evolved to the rectangular wire positioned flatwise, and now claim superiority by positioning the rectangular wire edgewise, with the reservation that the round wire should be used during the earlier stages of the treatment or in combination, with sectional arch construction. It is well known among hunters that when one is lost, one will circle about and return to one's original position. The return

to the round wire in the earlier stages of treatment in conjunction with completion by the edgewise arch, is evidence that a round wire for the working portion is better adapted, that it is more easily controlled while the teeth are in positions of greater irregularity, just as Dr. McCoy has stated and as Dr. Angle has recommended in his articles on the edgewise arch.

It is at once apparent to the orthodontist that in the employment of a regulating mechanism (the two vital parts of which are the force unit and the attachment for positioning the arch and the transmission of force) the arch wire will first be assembled on the alveolar form in curvature alignment as required, that changes in the arch form of the wire will be required during treatment; in varying degrees horizontally, during lateral development, in varying degrees vertically and anteroposteriorly during adjustments to produce the normal occlusal plane, and particularly will varying degrees of angulation be required for the employment of torque pressure in positioning teeth during bodily root movement to their normal axial inclinations. The rectangular wire offers much less resistance to deflection in the horizontal plane when it is positioned flatwise to the tooth surfaces, as the ribbon arch, than it does to deflection vertically. The edgewise arch offers decided resistance to deflection laterally and much less resistance to deflection, vertically. The desirability of employing a wire which presents a uniform modulus of deflection in varying planes, except as variations may occur in areas of decidedly different curvature according to the aligned position of the arch, as presented by the round wire, is apparent. Of course the flat wire is neat in position against the labial surfaces of the teeth, but the greatly increased wire surface contact is very objectionable from the standpoint of safety to tooth structure, relative to caries, thus necessitating bands upon every tooth.

Since the operator shall be required, therefore, to adjust an arch wire, already in curvature alignment, at various points along its long axis to various angles of torsional deflection in the application of the elasticity of torsion and also will be required to adjust, similarly, the bending deflection in utilizing the elasticity of flexure, the simplicity of control and the ease of adjustment are augmented by the minimum degrees in variation as set up by the compensatory torsional reactions. This is presented by the round form of wire, since the flexual stiffness of the round wire is constant for all longitudinal planes in which the bending occurs.

Again it should be emphasized that the stiffness of a round wire either in flexure or torque is proportional to the fourth power of the diameter. Or in other words, if the wire is changed to one-half the diameter, in comparison, one may exert sixteen times the amount of deflection or torsion without increasing the force. We herewith see the constancy in force control from manipulation of the round wire. In contrast to this, the following quotation from Mr. Gilbert Fish regarding the inconstancy and the incalculability of torsional stresses with a rectangular form is offered. Mr. Fish says, "A flat bar of elastic metal is not nearly so definitely calculable as to degree of rigidity as a round bar, because the radial elements from center of gravity to outlying points in and near the surface do not remain even approximately straight under torsional strain. At torsional stresses insufficient to cause general yielding, the strains

at and near the corners are known to be well beyond the yield point in shear. It is not surprising, therefore, that the angle of twist under a given torque cannot be so definitely calculated for a flat bar as for a round one, or that the angle is not proportional to the torque except at low values.''

The occasion for employing the flattened form according to the technic of resilient arch assemblage is at the point of attachment only; the employment of the blocks at the points of attachment convert the round arch wire into a flattened arch form at these points only, and for the purpose only of properly gripping the round wire at such points for twisting the round wire upon itself in the application of the elasticity of torsion. The compensatory torsional reactions are thereby simplified. The combined advantages of the fixed attachment for control at the point of adjustment as given by the flattened surface arch wire together with the ease in operation of the round wire in curved alignment, is herewith offered in presenting the advantages of the round wire arch.

It should be emphasized further that the resilient arch technic presents the desirability of an original arch form which conforms to the conditions as found at the beginning of treatment; that any attempt to start with a predetermined ideal arch form I consider as being inconsistent in application to an alveolar arch form which has little or no conformity to it, particularly since it is necessary to distort and thus destroy any such ideal conformation by the repeated adjustments which are necessary during treatment if any extensive movements are required. The power unit of the mechanism which consists of the resilient arches is in close adaptation to the structures throughout their entirety in construction and during the entire time of their application.

It is essential that the ideal arch form be conceived by the operator at the beginning of treatment, but such form is not mechanically incorporated in the appliance, at least until the alveolar outline would approximate that arch form, and then that arch would not be determined by computation according to the mesiodistal diameters of the anterior teeth, which was considered by Dr. Hawley himself as only a working guide. Rather, the means of arch predetermination would at least offer scientific discussion where scientific procedures are supposed to inculcate the technic.

In conclusion, I wish to emphasize that the technic of resilient arch assemblage as herewith presented offers the employment of special mechanical applications as accessories to the main assemblage, and variations in design of assemblage to meet individual requirements. These variations are as flexible as the ingenuity of the operator may give expression, nevertheless the technic is offered as one of decided standardization. Truly, one appliance will not efficiently treat all types of cases. We have repeatedly heard that there is no universal appliance. It is my experience, however, that the same fundamental physiologic and mechanical principles can be satisfactorily applied to stimulate cellular activity in all cases. It seems to me a difficult procedure in practice to attain the height of efficiency with radically different appliances. The gauge of the arch wires may vary to accommodate tissue reactions, but variations in types of arch wires or of attachments seem unnecessary. If the fundamental principles of tooth movement are to be accepted along biologic

lines and in accordance with physiologic laws, if stimulation by mechanical means without irritation and impairment of function is desirable, if in the final analysis Nature truly corrects the abnormality in response to our aid, and if the truly individual normal of the masticatory apparatus for any individual is the result of growth and development, why should we not resort to a standardized form of mechanical stimulation to induce cellular activity in the treatment of various types of malocclusion?

Whether the case calls for an increase or a decrease of cellular mass, mechanical stimulation will result in an absorption or a deposition, according to the direction of the stress applied, and the tissue changes about the individual teeth should always be within physiologic range. As before stated, this comparatively unified technic applies to the method of applying mechanical stimulation only; the various other vital considerations in orthodontic treatment are not here considered.

ERADICATION OF ORTHODONTIC MALFORMATIONS*

By Prof. Dr. Kantorowicz, Bonn, Germany

UP TO the present day, orthodontic treatment has been regarded as a luxury confined to the wealthy, and has thus far been beyond the means of the poorer classes. Completely developed cases necessitate the expenditure of much valuable time and call for the exercise of considerable artistic skill. High fees have therefore been demanded, and as a result the majority of persons in need of this treatment have never been reached.

This condition has causd the total number of orthodontists practicing in Germany to remain extremely small, while only five or six specialists could be found throughout the whole country. The great mass of the population remained untreated orthodontically, and the idea was never even entertained of converting this highly specialized and artistic branch of dentistry into a treatment suitable to the masses.

Among the children of Bonn nearly 50 per cent suffer from irregularities of the teeth, and fully half of these require attention, not so much from the health point of view as for the sake of appearance. Any irregularity in a denture together with a malformed jaw causes considerable distortion of the features, and such abnormality is regarded in these days as a facial disfigurement, which is especially undesirable in the case of girls.

So far the methods in use for the treatment of the masses have proved valueless. The old orthodontia was concerned almost exclusively with fully developed malformations, those in process of development being scarcely recognized, while research into the origin of abnormalities was not encouraged by the existing dental schools; the reason being that only patients with fully developed malformations came forward, and the prominent representatives of orthodontia considered that a knowledge of causes would not facilitate treatment.

The problem of dealing with the masses seemed at the outset impossible of solution; however, it occurred to us that it might be feasible to treat orthodontic malformations in a manner similar to that which we have adopted in eliminating caries among the children at Bonn, that is, by introducing prophylactic measures.

Orthodontic malformations are in general fully developed by the twelfth year, but are nonexistent in the newborn child, hence the period of development is during the first twelve years. The procedure indicated was, therefore, to note the progress of malformations at different ages; and to this investigation we have given constant attention, from the day that I took over dental school hygiene at Bonn, in 1918.

The first step was to carry out an examination of malformations caused by premature loss of teeth, as a consequence of extraction; from these ob-

*Transactions of the European Orthodontological Society.

servations certain very simple rules relative to constitutional effect were evolved. At the same time we started a collection of models, taken from malformations found in children of six years of age; this was done in the expectation that in later years some measure of increase or decrease might be observed.

Every year a new impression was taken from each of these children, so that the development of any abnormality could be followed by means of the series of models. All impressions which did not promise to be of interest were yearly eliminated, and replaced by others; we always retained, however, 150 malformations under observation. These observations dealt with the following groups: eruptional disturbances; intermittent physiologic gaps; narrowed arches with overcrowding of the front teeth, with or without dis-

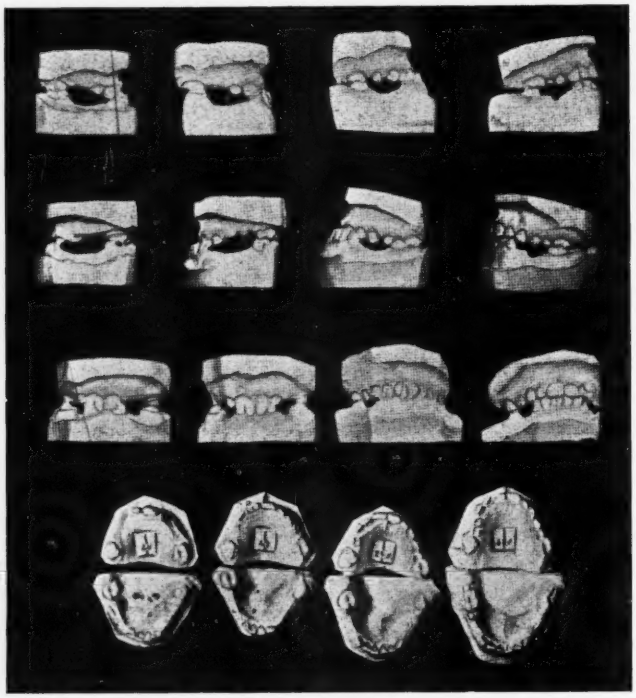


Fig. 1.—Self-correction of a case of mandibular prognathism.

tal occlusion; narrowed arches with slight protrusion or gaps, with or without distal occlusion; sucking malformations; open-bites; overbites; mandibular protrusion; edge-to-edge bites; diastema; consequences of extraction, etc.

The above is practically a complete list of all malformations observed between the ages of six and twelve years.

In a paper entitled "Self-correction of Orthodontic Anomalies," published in 1927, is a report regarding certain of our observations in connection with the above. Some of the models dealt with the following: the hardly credible curing of mandibular protrusion; the cause of failure to cure in special cases; the influence which the absence of gaps has upon the subsequent position of the incisors; the significance of belated loss of the second deciduous molar regarding the development of distal occlusion. All these conditions could be observed by means of our series of models (see Fig. 1).

We found that a large percentage of the children on entering school suffered from some form of malformation; this led us to carry out a systematic examination of infants. Those cases where rickets had manifested gave great promise of being subjects from whom valuable data might be expected. I undertook these examinations in conjunction with Dr. Korkhaus in 1925,

Fig. 2.—Comparison of normal and rickety jaws of young babies (Kantorowicz-Korkhaus).

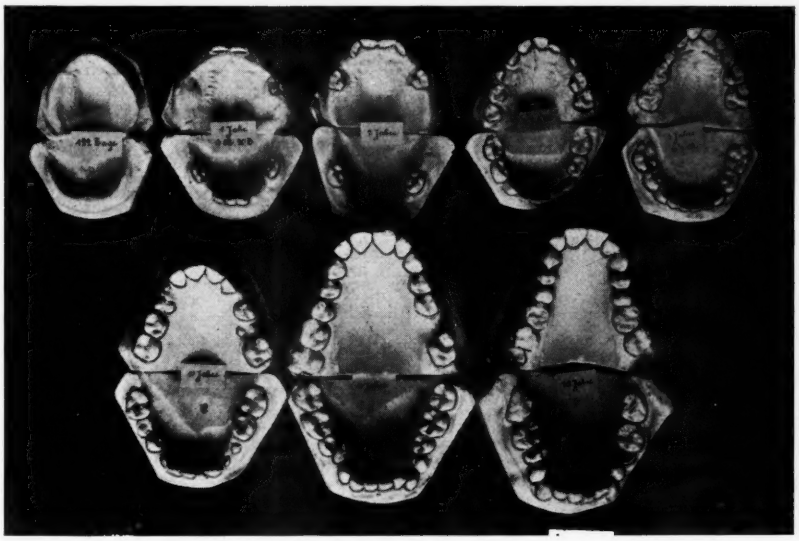


Fig. 3.—Development of the compression of the jaws by rickets (Kantorowicz-Korkhaus).

when we had about seventy children at our disposal; our observations showed that the majority of malformations could be recognized in the earliest days of childhood, and very often in the first year (see Figs. 2 and 3). These observations were based on the softening of the bones as caused by rickets, and the influence of outside factors.

Children who had reached the age of six months were found to be already too old to enable us to ascertain the primary origin of malformation—hence Dr. Korkhaus undertook the examination of babies (see Fig. 4). These investigations led to the interesting discovery that with newborn infants the mandible was distal in respect to the maxilla, and only in the course of the first three to four months does it make up for restricted growth; at times, however, normal growth is actually exceeded, so that the mandibular incisors erupt in a prognathic position. It was not possible, however, at this point to determine to what extent conditions were governed by circumstances, or by fate, that is, by biologic inheritance; and since the family researches which I had already inaugurated—and which were the first to be made in connection with dental science—did not offer sufficient exact material to prove inheritance, it was decided to institute an extensive research among twins in connection with other clinics. This work was undertaken by Dr. Korkhaus, and the material was supplied by the school children of Bonn.

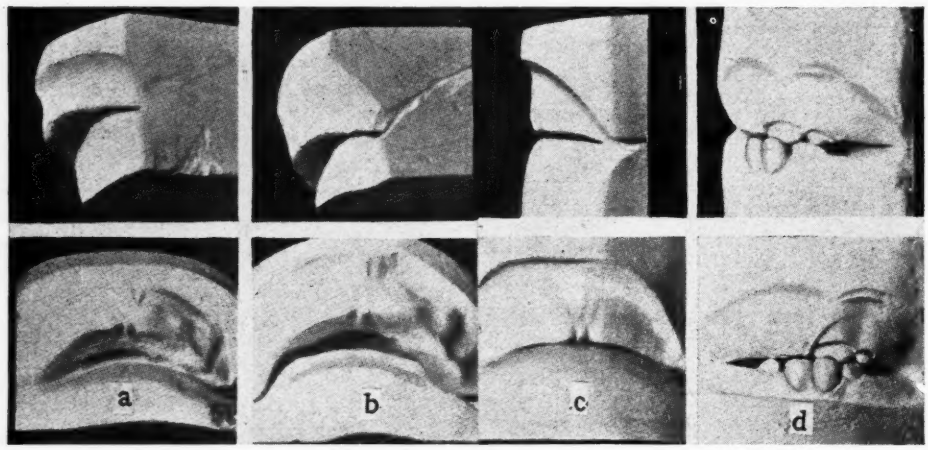


Fig. 4.—The beginning of the mandibular protrusion in a child of one year (Korkhaus). *a*, Baby on the day of birth. *b*, The same baby eight days old. *c*, The same baby at the age of four months. *d*, The same baby one year old.

This twin research enabled us to separate distinctly abnormalities which were inherited from those which were acquired. A statistical record of malformations found in children at the ages of six and fourteen years was compiled by Dr. Korkhaus (see Fig. 5). From this record we note that certain malformations show a decrease in number, at the latter age, owing to their self-correction; while with others the number has increased, these being newly developed. This circumstance could be anticipated from the appearance of the models, but the actual statistical statements ruled out all elements of chance.

With regard to the causes underlying this self-correction, or "new development," as the case might be, the statistics naturally gave no clue; we obtained, however, a considerable and valuable supplement to our collection of models.

At this point I would like to mention that practically all these investigations were treated with entire indifference, even by the most famous repre-

sentatives of orthodontic science. It was suggested that research along these lines was of no practical value and that knowledge of the origin of malformations could not lead to the establishment of a cure. This objection, while having a certain validity, quite fails to take into consideration the prophylactic idea. I am inclined to a scientific optimism which suggests that sometimes even the most abstract and unrelated sciences may prove in the end to be of practical value in an investigation.

The great progress made in vitamin research has resulted in the possibility of eliminating the danger of rickets, which malady we had recognized as the principal cause of malformations. During the first year, all children treated for rickets were either cured or saved from attack, but as the percent-

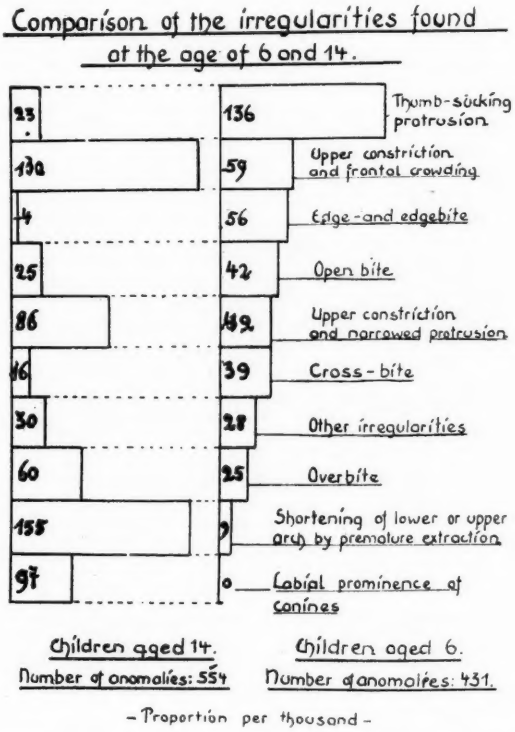


Fig. 5.—Frequency of orthodontic anomalies of various ages according to the statistics of Korkhaus.

age so treated was small, we failed to obtain any conclusive results. Owing, however, to the discovery of irradiated ergosterol by Windau, the following year brought a full measure of success. The local infants' home (Professor Gött and Stadtmedizinalrat Basten) succeeded in reducing the percentage of children affected with rickets from 50 per cent to 33⅓ per cent, a remarkable result with regard to both its general significance and its hygienic effects. The new discovery at once extended the sphere of dental school hygiene, especially with regard to caries. The control of rickets will mean a reduction in orthodontic malformations of about 30 to 40 per cent. The full effect of this achievement will, however, not be felt for some three to five years.

The following groups cover the principal malformations investigated during this period of our research.

CROWDING OF THE JAWS, CAUSED BY PREMATURE LOSS OF TEETH

This condition leads to the abnormal states of maxillary and mandibular protrusion, as well as prominent canines. Such malformations are easily treated and have practically disappeared in Bonn, owing to the fact that permanent teeth are no longer prematurely extracted; as a result we are compelled to look elsewhere for our investigation material. On the other hand, malformations caused by the premature loss of deciduous teeth have not yet disappeared, such extractions continue, and will continue to have their effect, until all the children are free from rickets when they reach school age. This will begin to be the case in 1931; then it will be found that malformations from this cause will likewise disappear—just in the same way as those which were brought about by the premature extraction of permanent teeth.

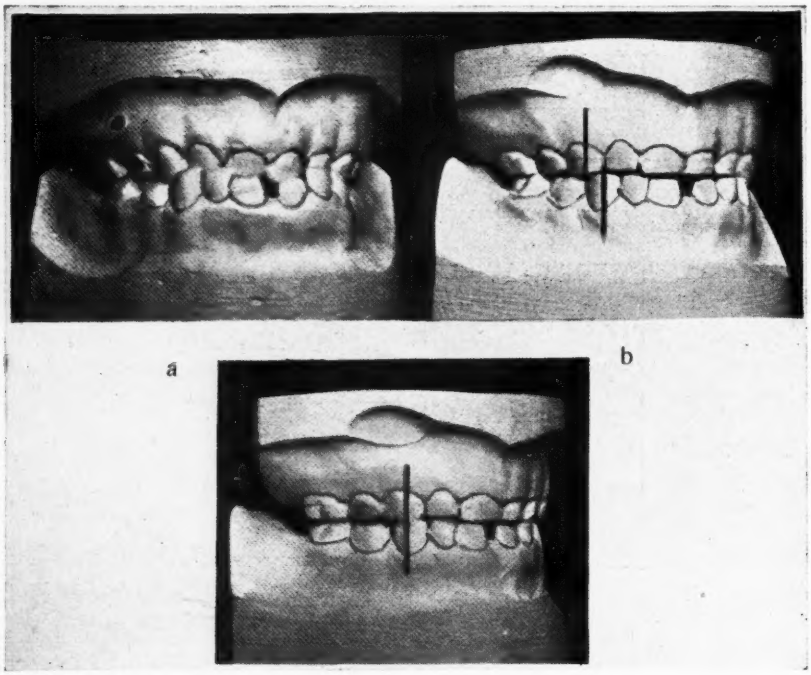


Fig. 6.—Prophylactic treatment of mandibular prognathism by grinding the edges of the deciduous front teeth.

In the meantime we have decided to insert a small, ready-made, extension apparatus after the extraction of every deciduous tooth; this apparatus keeps the space open. Since all children are examined twice a year, we shall thus be able to cope effectively with anomalies which would be caused by such extractions, and their disappearance is therefore already assured.

MANDIBULAR PROTRUSION

In this case an attempt is made to assist the mode of self-correction—which I had already observed—by artificial means. I ascertained that mandibular protrusion is found in three different stages, and is practically in its first stage at the age of six years. It is characterized by the fact that in almost all cases there still exists a neutral occlusion with a slight deviation toward mesial disarrangement; this can, however, be easily corrected by dis-

tal pressure to the extent of contact of the incisors. It became apparent therefore that we must remove the obstacle preventing the sliding back of the mandible into its normal resting position; as this obstacle is the forced bite, and is always caused by the opposition of the incisors, and mostly by the mandibular canines, it sufficed to remove this forced bite by grinding down the deciduous canines, and in some cases also the deciduous incisors, to the extent of 1 to 1½ millimeters. Experience shows that the children are little inconvenienced by this grinding process, as with careful handling it is not painful. As soon as this work is completed, the mandible slides back from its previous forced position into its normal resting-place, while the front of the jaw is correspondingly affected (see Fig. 6). The change of the incisors affects the position of the front, altering the appearance due to the retarded development of the maxilla.

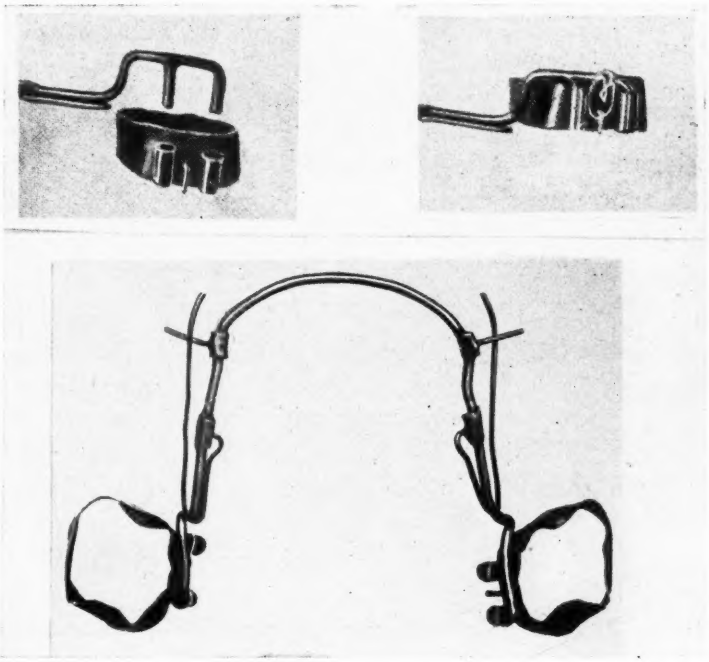


Fig. 7.—Lingual arch in half-precious material for the systematic treatment of the jaw compression (Kantorowicz-Korkhaus).

In certain cases it is necessary to expand the bite; this is done by means of bands attached to the first, or primary, molars; these bands project over the chewing-surface from 1 to 2 millimeters.

We had the opportunity of treating 120 cases of mandibular protrusion in the course of one year, the actual treatment lasting about ten minutes; some 30 per cent of our cases did not respond. Where no response was found, an apparatus was employed to push the maxillary incisors forward after they had erupted, that is in the seventh year.

NARROWNESS OF THE JAWS AND FRONTAL CROWDING

As long as children suffer from rickets during infancy, so long will these malformations require treatment by means of suitable apparatus. In

such cases our procedure for the time being is to widen the jaw until it is normal; this is done by aid of the Mershon apparatus, which can be obtained from the firm of "Dentaurum." A feature of this apparatus (see Fig. 7) is the double link fastening which is shown both open and closed by means of a ligature. The requisite tube for the link can be bought in length and cut to requirements, and the necessary pressure is obtained by the use of spring wire. The apparatus is considerably cheaper to construct than that of Angle and is easily and quickly made. In using the appliance the customary rules are followed, and owing to the youth of the patients, very quick results are obtained. The expansion should never exceed 1 millimeter per month. Since the narrowness of the jaw is seldom more than 4 to 5 millimeters, it attains to normal form and shape in about six months, and this without the child noticing the alteration.

In the beginning we feared that our appliances might often become damaged while in use; experience, however, taught us that such damage was of rare occurrence. During treatment, however, toffee and gum must not be sucked. Children soon become accustomed to the lingual arch, so that they no longer feel it after the first few days. An examination is made every three to four weeks, and at intervals of from four to six weeks the apparatus is expanded about ¾ to 1 millimeter by means of the spring. We have not as yet finally decided upon the most simple form of retention device. In special cases we intend to remove the adenoids at the conclusion of the treatment, which operation will take place in a separate room, and be performed by a nonorthodontist.

In the majority of cases the early widening of the jaw is sufficient to allow a distal bite, which is in the course of development, to grow back into its normal position. Just as in the case of mandibular protrusion, where a forced bite exists in mesial position, so with narrowing of the jaws we have occlusion in distal position. A foot can never slip forward into a shoe which is too narrow, similarly the mandible cannot grow forward into a narrow maxilla—both will remain in a backward position in distal occlusion. In the course of the year we have inserted about 350 lingual widening appliances.

THE OPEN-BITE AND DISTAL BITE (MAXILLARY PROTRUSION)

In the majority of cases the open-bite corrects itself, provided there be no twist in the angle of the jaws. Up to now we have had no cause to interfere in these cases, but we shall be compelled to do so at a later date.

The treatment of the distal bite has not yet been begun on a large scale. At one time I thought that after the extraction of the first permanent molars I could make use of the shortened jaw (the reduction of which had been brought about with experimental accuracy) for the relative shortening of the maxilla; but suitable cases were too rare to permit of this being done on a large scale, the necessary contemporaneous conditions being as follows:

(1) To obtain the children shortly after the eruption of the first permanent molars.

(2) Broad jaws, not needing treatment with any mechanical appliance.

(3) Hypoplasia, which would subsequently make extraction necessary.

Such conditions as the above would obviously seldom occur concurrently.

Other means must therefore be adopted to treat the distal bite, and such must be chosen from among those at our disposal. The prophylactic measures of Rogers are out of the question, as these will never be observed by children. Intermaxillary rubber bands are also unsuitable for the young; as parents have little time to interest themselves in subtile rubber ligatures and are liable to use them for any purpose other than that for which they are intended. We are therefore reduced to such measures for the rectification of the bite as will make all occlusions but the advancing positions uncomfortable for the children; but here we are without any experience with regard to the treatment of the masses.

Fig. 8.—Models taken during different stages.

EXCESSIVE OVERBITE

During our first year we were unable to treat this malformation, but it is our intention to do so as soon as those abnormalities which are more easily dealt with have ceased to present problems. We propose to act on the excessive overbite during the eruption of the permanent incisors. It is anticipated, however, that a number of difficulties will be experienced, because of the numerous forms taken by this malformation, and which prevent at present the adoption of any definitely formulated treatment. A report upon this subject will be published later.

In the town of Bonn, where general social conditions are relatively good, we estimate that some 40 to 50 per cent of orthodontic malformations require treatment. Already we have ascertained that about 70 per cent are checked, these being restrained in their development and finally cured (see

Fig. 8). In about three years from now a new era will dawn for orthodontic prophylaxis, for then our campaign against rickets will make itself felt.

The success resulting from years of scientific research directed to jaw malformations has been greater than we could have imagined; for it is now possible to check this widespread malady at comparatively low cost, and to place within reach of all classes the blessings of orthodontic treatment.

As an example of one change which has taken place, resulting in the conversion of the highly specialized and partly artistic science of orthodontics into a general treatment for the masses, largely governed by our scheme, I would cite the fact that the Orthodontic Department of our University Clinic has been absorbed by the Municipality, and that the work now comes under dental school hygiene. It has been made possible through the personal and expert supervision of Dr. Korkhaus to focus the general orthodontic interest of Bonn on these most difficult of all dental manipulations, and to carry out the work conscientiously and without friction. The time when orthodontic treatment was confined to the wealthy has now finally passed.

The introduction of orthodontic prophylaxis is of great importance to school hygiene. The dental school surgeons who up to now have performed practically only mechanical work, will find in the future a new scope full of problems, and their activities will be raised from a monotonous routine into a highly intellectual sphere in which their abilities will be taxed to the utmost.

With increased knowledge and experience it is possible that, as a result of the working of the general scheme, to which I have drawn attention, a point may finally be reached when there will be but little further call upon the creative faculty; but I feel confident that in this great world with its many problems, the inquiring mind will ever find opportunity for the exercise of its zeal, and material for its impulse to further research.

INVESTIGATIONS INTO THE INHERITANCE OF ORTHODONTIC MALFORMATIONS*

By Dr. G. Korkhaus, Bonn, Germany

AT THE Congress held last year in Brussels, I had the honor of bringing before your notice my investigations regarding twins; these researches offer a suitable means for probing more deeply into the sphere of inheritance, which sphere is still shrouded in mystery. Since that time I have systematically continued my work in this direction, and I have in many cases been able to confirm dental indications observed in the condition of twins by means of an examination of other members of the family.

The usual methods employed in research concerning human heredity were found unsuitable in the case of investigations regarding the inheritance of distinctive dental features. The principal difficulties met with are due to the complex hereditary conditions connected with these features, their complicated origin, the obliterating influence of outside factors, and above all their instability. All these circumstances interfere with research concerning the pedigrees of the most distinctive appearances, both in the bite and in the cavity of the mouth.

A considerable number of the above difficulties can be overcome by extensive and systematic investigation, among uniovular and biovular twins. Such investigations tend to a certain extent to throw light on the proportion of heredity, and of outside factors involved in the origin of distinctive dental features, and also to do away with the apparently mysterious character suggested by their outward appearance.

Investigations regarding twins have, however, certain limits, and it is well not to expect too much. In a special case, for instance, similarity exhibited by some very rare distinctive appearance occurring with a pair of uniovular twins, may not mean inheritance, while on the other hand, a difference of appearance may not suggest noninheritance. We can only hope to remove the disturbing influence of such variations in manifestation, which can so easily confuse the apparent picture, by observations carried out on a large scale. There is, however, another method of making more certain of the probable correctness of our inferences in special cases, and this is by extending our research to other members of the family.

The like reappearance of any interesting and possibly rare distinctive feature at once claims our attention and may lead to the elucidation of a possible family recurrence. Owing to the above-mentioned difficulties, family researches—free from all assumptions—will not be able to clear up the hereditary modus of all distinctive dental features. When, however, family researches are conducted after an investigation of twins has indicated the path

*Paper read before the European Orthodontological Society, May, 1929, at Heidelberg.

to follow, and the material has been placed in proper order, and the principal nonhereditary causes have been separated out, then much new knowledge may follow.

Investigations concerning malformations of the jaws in twins have up to the present been restricted to the establishment and comparison of occlusion and its anomalies. These, however, did not lead to an elucidation of the hereditary question regarding jaw malformations, since although the deviations in occlusion represent important anomalies in the mesiodistal direction, these are in no way the principal characteristics in the complex of the different symptoms, with which they are connected in one and the same case of anomaly. We can therefore scarcely expect a deeper insight into the main issue of etiologic connection regarding orthodontic malformations from researches into malocclusion.

Last year I could only demonstrate a certain number of interesting results, obtained from individual pairs of twins, but the greater material now at my disposal permits me to draw more general and valid conclusions, since all principal cases of orthodontic malformations are now accessible in sufficient number. The statistical results regarding occlusion showed a scarcely greater conformity of bite-types with uniovular twins than with biovular twins; hence hereditary factors do not appear to play an important part in the origin of malocclusion, on the other hand we cannot consider these anomalies as solely acquired.

At this point I wish especially to draw attention to the *relativity of hereditary conceptions.* Distinctive features due to purely hereditary causes are just as rare as those which are exclusively acquired. In nearly every case there is cooperation between the two great sources of influence—inheritance and the outside factors. It is from these that the distinctive features originate. It is therefore of little importance merely to prove that a malformation is inherited or acquired, but what is important is to ascertain in what proportion the influence of the one or the other cause is present.

If we classify our results from this point of view, we find that only in the case of excessive overbite and inferior protrusion is there a predominating hereditary influence. With all other malformations outside factors play a principal part in their origin. This seems especially to apply to anomalies due to narrowness of the jaw, since here the extraordinary great variability found in the anterior width of the arch (i.e., the distance between the first premolars) in contrast to the posterior width of the arch, even in identical twins, suggests unmistakably that the origin of the narrowness of the jaw comes under the predominating influence of nonhereditary factors, even if certain hereditary components, such, for instance, as a disposition for rickets, or for exudative diathesis, has made its influence felt.

The truth thus established is not altered by special cases, where a similar appearance in the narrowing of the jaws is observed in both twins. In such cases the similarity may be surprising, and particularly for this reason, namely, that the special features found with both twins, such as the shape and size of tooth crowns, shape and form of palate, wrinkles in the palate, position of the frenum of the lips, etc., increase the impression given of conformity

almost to the point of absolute similarity. Such single cases of conformity can, however, never be taken as proofs, since they are easily confuted by any one who has access to a large quantity of material.

I will now draw your attention to a few cases among twins, which will demonstrate both conforming and nonconforming types of anomalies due to the narrowness of the jaws.

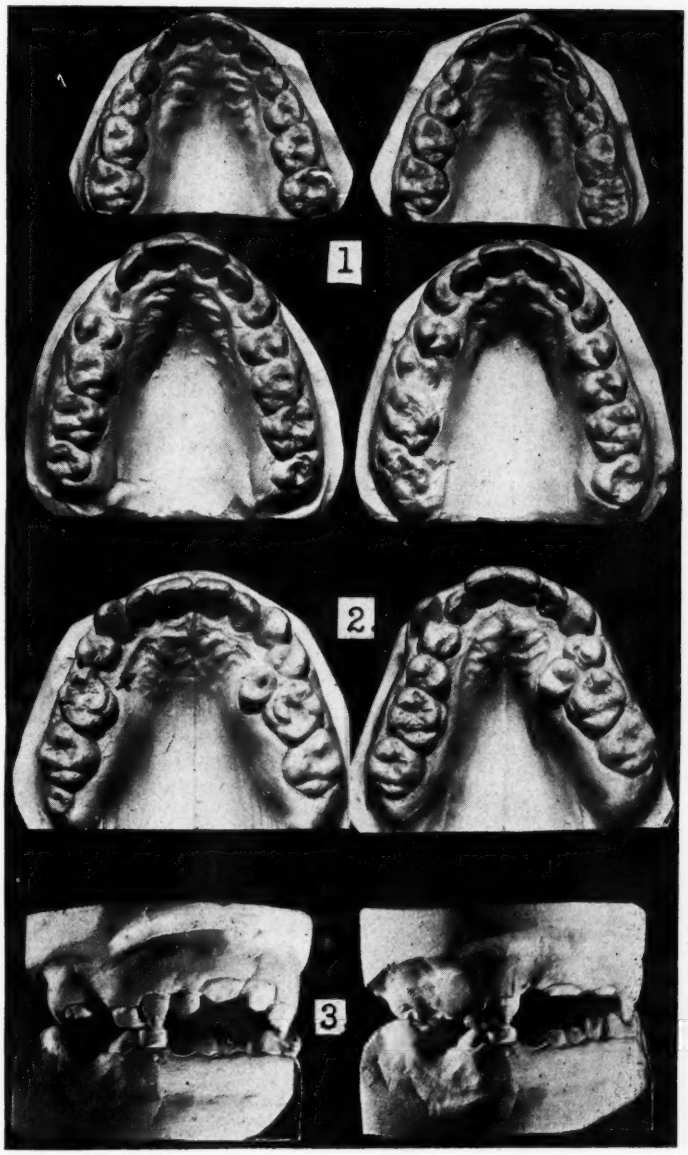


Fig. 1.—Similarity in the narrowness of the jaws and in regard to the deciduous and permanent teeth, in a pair of uniovular twins.

Fig. 2.—Great differences in the narrowing of the jaws in a pair of uniovular twins.

Fig. 3.—Striking similarity of open-bite, in a pair of uniovular twins (see Fig. 4).

Fig. 1 shows a case of striking similarity in this respect, and also in regard to the deciduous and permanent teeth of a pair of uniovular twins, while a second pair shows slight differences. In Fig. 2 (also uniovular twins)

we find considerable variations in both the shape and the form of the narrowing of the jaws.

In the second group of anomalies—the open-bite—the comparison of identical and nonidentical twins resulted in finding a greater similarity in the

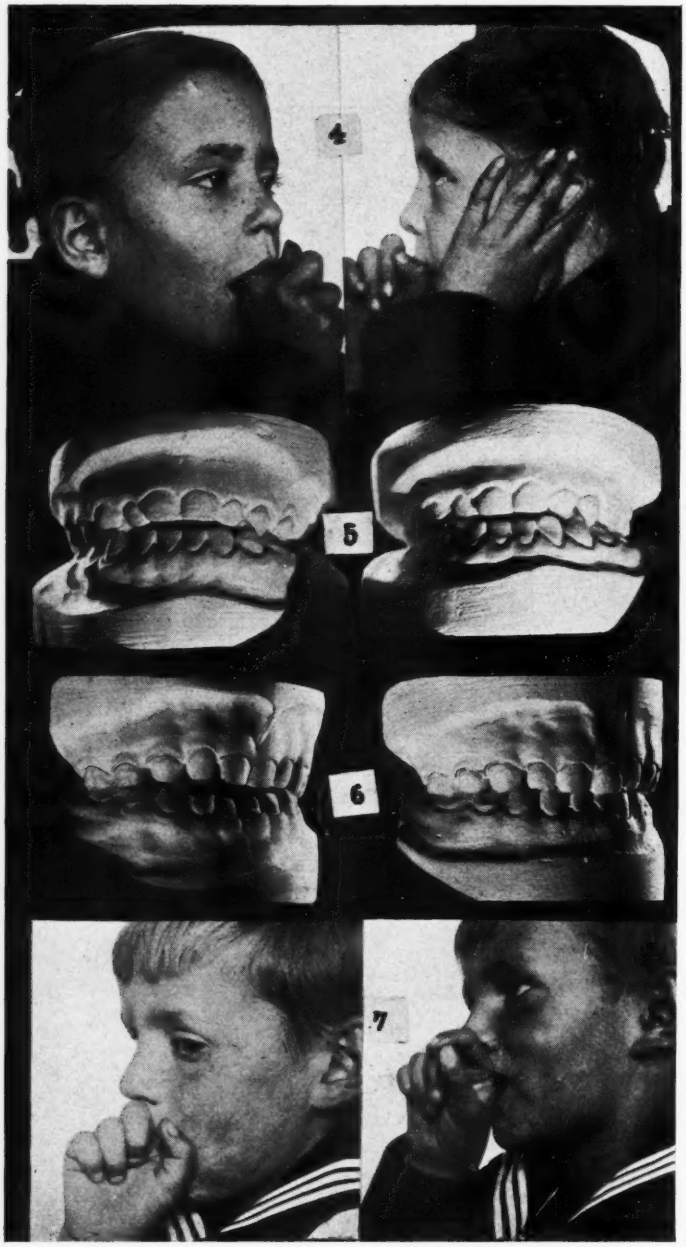


Fig. 4.—Like mode of sucking which resulted in similar open-bites (see Fig. 3).

Fig. 5.—Corresponding similar open-bites in a pair of identical twins with similar sucking habit.

Fig. 6.—Open-bite in the case of one only, of the uniovular twins of Fig. 7. These have a different sucking habit.

Fig. 7.—Different sucking method of identical twins, which resulted in an open-bite with one twin only. (See Fig. 6.)

jaws of uniovular twins. This can, in all probability, be traced back to a large proportion of constitutional moment, such for instance as rickets, which

could be responsible for the open-bite, or perhaps to an inherited disposition for a special sucking habit, since in nearly every case the difference of pressure effect, as shown in the open-bite, can without difficulty be explained as caused by different mechanical effects, brought about by the sucking habit.

We have in Fig. 3, a striking similarity in the open-bites of a pair of uniovular twins, caused by a like method of sucking a bent pointing finger, as shown in Fig. 4. Corresponding similar open-bites of another pair of identical twins, with a like sucking habit, are shown in Fig. 5.

The identical twins of Fig. 7 have, on the other hand, each a completely different method of sucking. One of these uniovular twins puts its finger right into its mouth, as shown, while the other only sucks the back of its hand. This difference has resulted in an open-bite in the case of one of these twins only, Fig. 6.

We next note that the methods of sucking adopted by the biovular twins in Fig. 9 have also produced different results. In this case one of the twins sucks intensively nearly all day long, and also bites its finger; here we have a clearly formed open-bite (see Fig. 8); while with the other, who only sucks occasionally, we find merely a minor maxillary protrusion.

In such cases it would be hardly possible to speak of an outstanding hereditary influence, unless we concede that probably strongly impressed hereditary moments have a great influence on the origin and distinctive features of the open-bite.

Quite unexpected results followed from an examination into the *consequences of extraction,* that is, anomalies in the position of the teeth brought about by premature loss during the period of jaw development. As the genesis of these anomalies has been relatively well investigated, and as a cause fully capable of proof is now recognized, such cases have had to be grouped almost exclusively under outside factors. Investigations with twins led to the somewhat curious result that a greater similarity regarding the consequences of extraction was found among uniovular twins than among biovular twins; this fact points, without doubt, to a preponderance of hereditary disposition.

This unexpected result finds an elucidation through the special conditions which have been introduced by the systematic dental school at Bonn. There the extraction of permanent teeth, and therefore the arbitrary consequences of such extractions, has become rare, hence there only remain such cases where the premature loss of deciduous teeth causes a disarrangement of the teeth in the arch.

Very frequently I have observed the second deciduous molar to become loose, especially in the mandible, during the seventh and eighth years of life, and subsequently to fall out, so that the gap thus caused in the arch remained unprotected for some years.

Probably constitutional factors and factors under hereditary influence are connected with these premature resorptions, whereby the frequent cases of conformity in identical twins can be explained. That, however, non-hereditary factors also play an important if not a principal part, is best proved by other examples, where distinct differences are shown. I will now

select from a large number of cases, in which extractions have been followed by certain results, a few examples showing conformity, and others in which considerable differences can be seen.

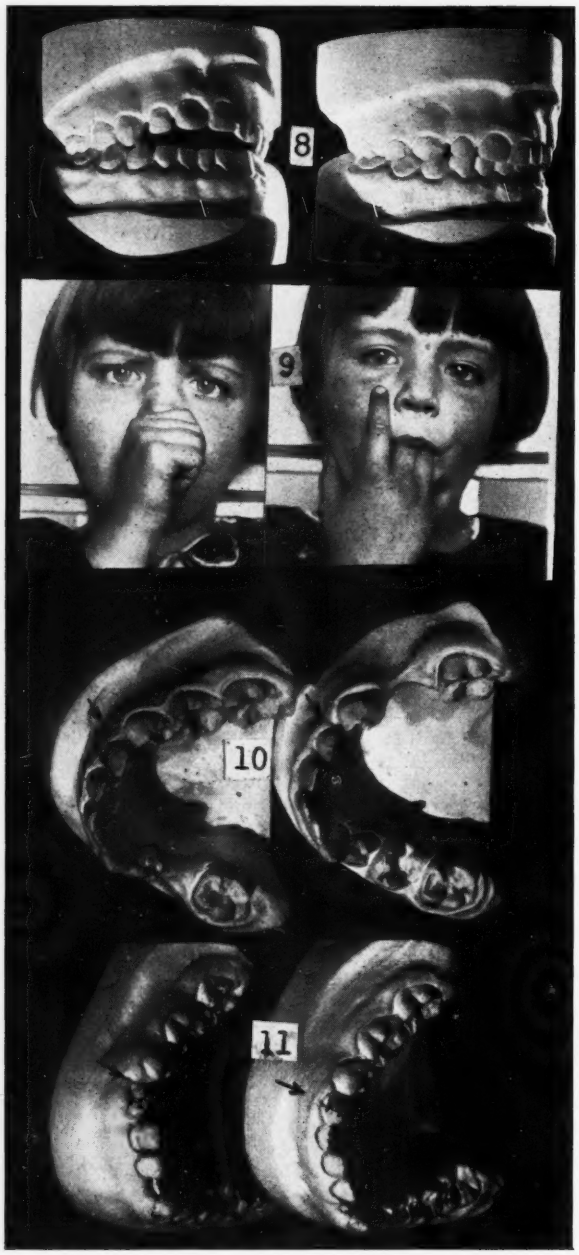


Fig. 8.—Open-bite in the case of one only of the pair of biovular twins in Fig. 9, who have each a different sucking method.

Fig. 9.—Different sucking method of biovular twins, which resulted in an open-bite with only one twin. (See Fig. 8.)

Fig. 10.—Similar anomalies as a consequence of the premature loss of a deciduous tooth in the case of a pair of identical twins.

Fig. 11.—Difference in the appearance of an anomaly in a pair of uniovular twins.

Taking now the bites of the pair of uniovular twins of Figs. 10 and 11, we note in Fig. 10 the absence of the right mandibular canine, the shifting

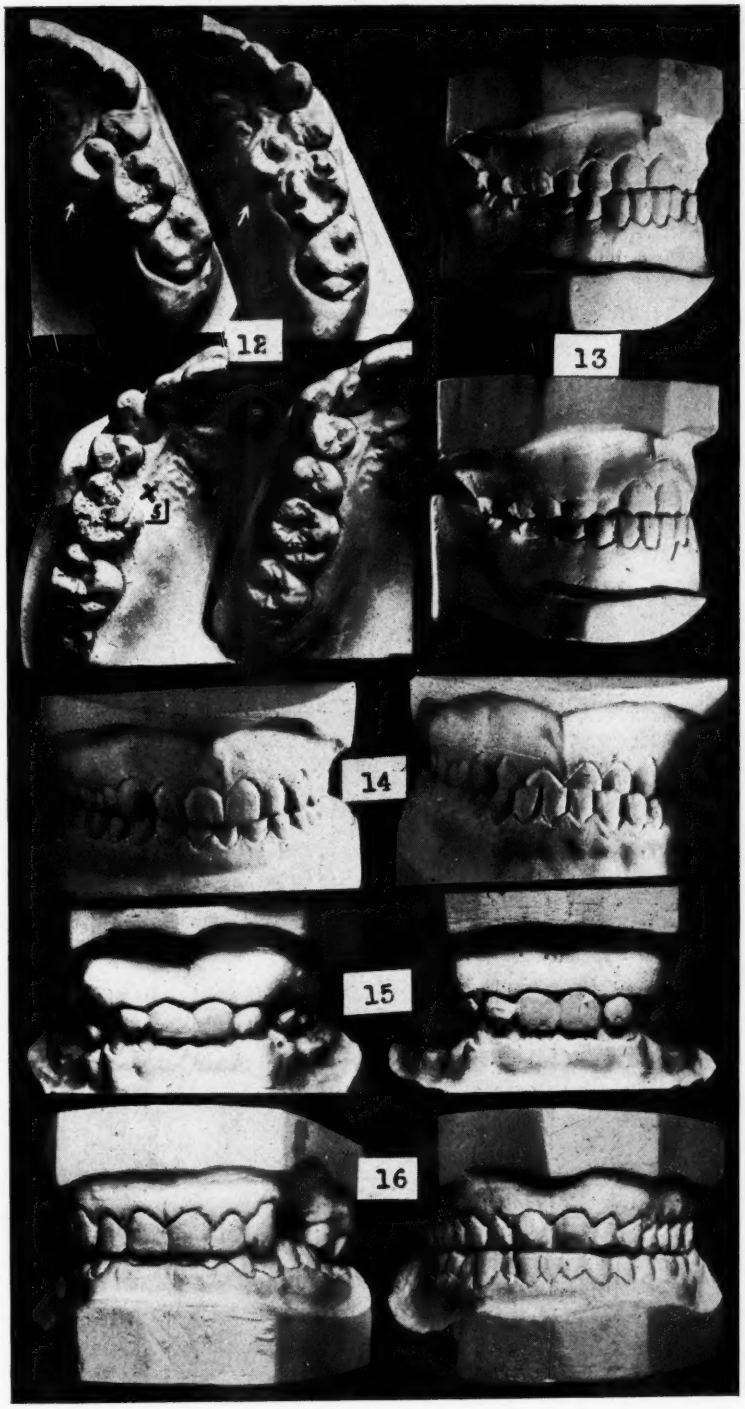


Fig. 12.—Striking similarity of an anomaly resulting from a premature loss of teeth on the life side in the case of identical twins, with dissimilarity on the right side.

Fig. 13.—Early stages of Class III in a pair of uniovular twins.

Fig. 14.—Mandibular protrusion (Class III) with one only of a pair of identical twins. In the family the mandibular protrusion with a mesioclusion is found with many of its members.

Fig. 15.—Similarity in the appearance of an excessive overbite in a pair of uniovular twins.

Fig. 16.—Excessive overbite with one only of a pair of biovular twins.

of the middle line, and the closing of the gap. The same appearance again occurs in Fig. 11, but with only one of the twins.

With the identical twins of Fig. 12, the palatine displacement of the second premolars is most remarkable. Here again we have the same constitutional moments, as a bad calcification of the deciduous molars and a premature pre-absorption led to the loss of the teeth and the closing of the gaps. That, however, the same results are not always brought about is shown by the condition of the right side of the maxillas of these same twins; where with the one, the second premolar has been displaced in a similar manner; while with the other, this tooth could still find its place, by forcing the canine to erupt in a prominent position.

If we now turn to a different deformity, the mandibular protrusion, we find in this the only orthodontic malformation for which inheritance can be claimed with a certain amount of justification, since all attempts have failed to connect paratypical factors with this abnormality. The best known is the frequent recurrence of Class III type in the family of Habsburg, whose family tree has been investigated from an orthodontic point of view by a number of authors, especially Rubbrecht and Kantorowicz. How unreliable paintings and pictures are for research and study is shown by the fact that the only skull of a Habsburg which Kantorowicz could examine, did not show a real and true prognathism, but a retrusion of the maxillary front teeth, which was caused by the absence of the lateral incisors.

With a number of identical twins, I found a similar appearance in the case of prognathism, which owing to the rarity of this anomaly suggests inheritance; an example is shown in Fig. 13 of uniovular twins whose bites are strikingly similar. But I also discovered, curiously enough, in one pair of identical twins, a case of dissimilarity, Fig. 14. An assumption, however, that just this case should be considered as one of noninheritance would have been erroneous, since from an examination of the family it was found that various members showed the appearance of a mandibular protrusion.

Just as in the case of the mandibular protrusion, so does the *excessive overbite* give a clear suggestion of inheritance. In nearly all cases identical twins showed absolute conformity; as for instance the uniovular twins of Fig. 15. With nonidentical twins, however, a different appearance could almost always be noted, Fig. 16.

These two malformations, the prognathism and the excessive overbite, prove themselves to be mainly due to inheritance. Since, however, distinctive features are comparatively seldom found with these abnormalities, this assumption is based upon relatively few cases.

For the above reasons I have endeavored to extend my research regarding the mandibular protrusion and the overbite, among a large number of families. Personal enquiries and enquiries by letter were made regarding cases of prognathism distributed over twenty-seven different families, which were for the most part under treatment in my department. From these, more than half the replies received stated that among some of the members the self-same deformity, due to this malformation, existed. With regard to the

excessive overbite the proportion was found to be similar. In all cases which I followed up, the observations of the members of the families proved to be correct.

I would like now to draw your attention to some of the family trees which have thus far been taken into consideration.

Chart 1 shows the family tree of a dental surgeon, who himself is afflicted with prognathism. This malformation has recurred with extraordinary frequency during four generations. Those members marked with a "ques-

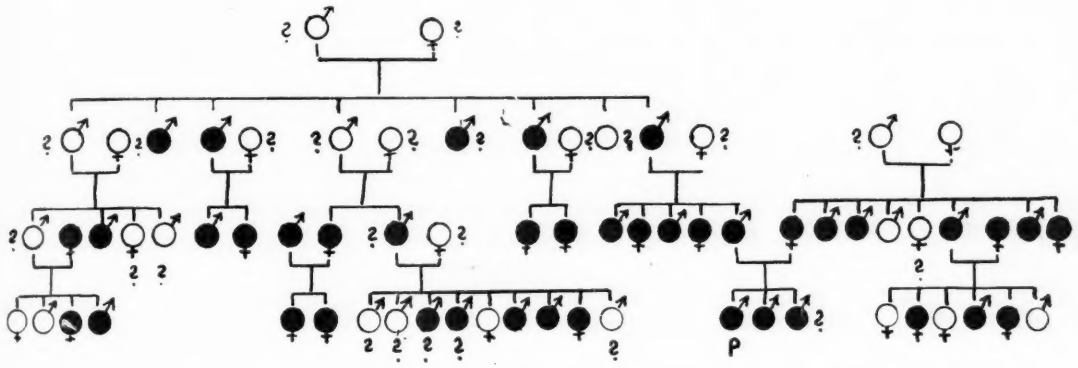


Chart 1.—Tree of family L. Frequent recurrence of mandibular protrusion. (Class III.)

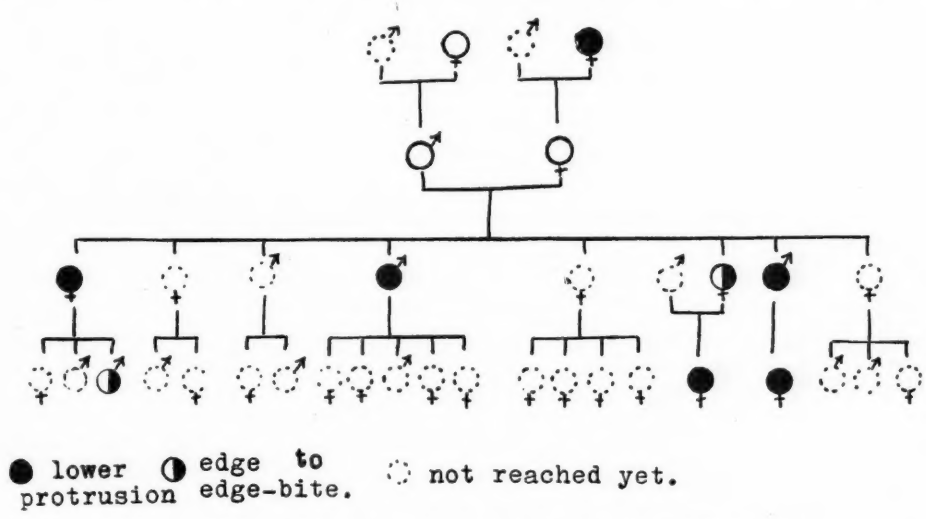


Chart 2.—Tree of family G. Mandibular protrusion. (Class III.)

tion mark," could not as yet be reached. It is a matter of special interest that more than once two individuals having this same jaw deformation met in marriage. The peculiar character of profile is apparently considered pleasing by persons afflicted with this malformation.

In Chart 2, which shows three generations, we find several members of a family with a prognathism which has recurred after an interval of one generation.

We now come to Chart 3, which shows a family tree in which we find an extremely interesting case, namely, the combination of inheritance of a mandibular protrusion on the mother's side, and a missing maxillary lateral

incisor on the father's side. Among the children of this marriage, the youngest daughter has a missing lateral incisor, the son an outspoken prognathism, while the eldest daughter has a mandibular protrusion as well as a missing lateral.

The next and last family tree, Chart 4, supplies an example of the frequent recurrence of excessive overbite in a family through three generations.

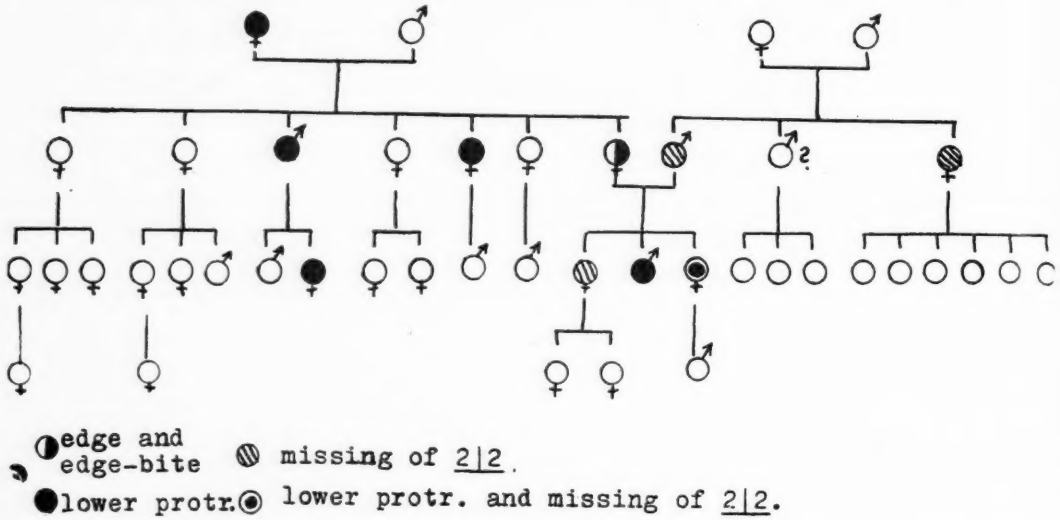


Chart 3.—Tree of a second family G. Inheritance of mandibular protrusion on mother's side, also of missing maxillary lateral incisors on the father's side.

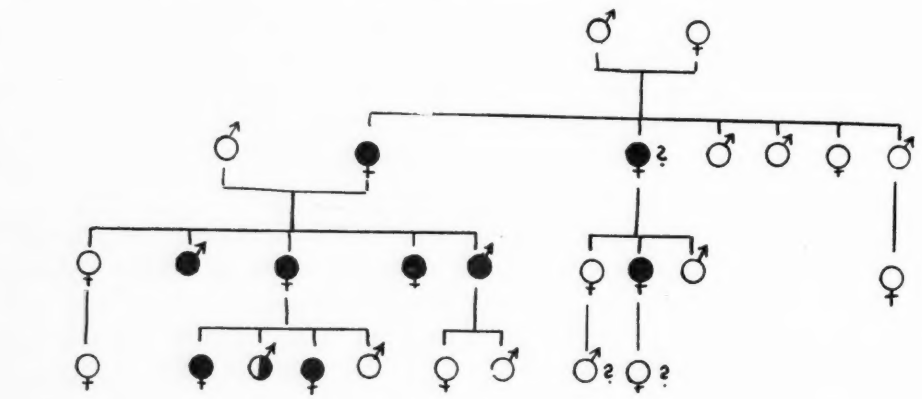


Chart 4.—Excessive overbite in family W.

To all appearance a dominant modus of inheritance exists in the case of prognathism as well as excessive overbite, which may differ in its manifestations.

By means of harmonious cooperation in research among twins, coupled with family investigations, it would be possible to penetrate into the secrets of inheritance, especially with regard to distinctive dental featues. Such research has already succeeded in clearing up, to a large extent, the mode

of cooperation existing between inheritance and outside factors in the case of special orthodontic malformations.

If only the interest of dental surgeons who are in practice can be awakened, and access thus obtained to the immense material which passes through their hands, then indeed will wide possibilities open out for research into the hereditary factor in human dentition.

DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

Sterling V. Mead, D.D.S., Washington, D.C., Director

M. N. Federspiel, D.D.S., M.D., F.A.C.S., Milwaukee.—Vilray P. Blair, M.D., F.A.C.S., St. Louis, Mo.—Theodor Blum, D.D.S., M.D., F.A.C.D., New York.—Leroy M. S. Miner, M.D., D.M.D., Boston.—Wm. L. Shearer, M.D., D.D.S., Omaha.—Frederick F. Molt, D.D.S., Chicago.—Robert H. Ivy, M.D., D.D.S., Philadelphia.—Edward L. Miloslavich, M.D., Milwaukee.—French K. Hansel, M.D., M.S., St. Louis, Mo.—W. M. Reppeto, D.D.S., Dallas, Texas

BENIGN TUMORS AND CYSTS OF THE ORAL CAVITY*†

By Bedford Shelmire, M.D., Dallas, Tex.

ALMOST every benign tumor found in the human body may have its analogue in the oral cavity. Among these may be included tumors of the vascular system, fibromas, lipomas, neuromas, neoplasms of smooth and striped muscle, dermoids, and the like. In addition, neoplasms derived from the dental system, as adamantinomas, epulides, odontomas, and the various dentigerous cysts, are encountered solely in this cavity.

ANGIOMAS

Angiomas are tumors in which the blood or lymph vessels constitute the most prominent part. Where blood vessels predominate, such tumors are called hemangiomas; where lymph channels constitute the chief portion of the growth, the tumors are designated lymphangiomas. Where both blood and lymph vessels compose such tumors, the term hematolymphangioma is applied.

Simple telangiectases occur anywhere in the oral cavity, especially on the vermilion borders and adjoining mucous surfaces of the lips and on the tips and sides of the tongue. Here they occur as simple capillary dilatations or pinhead to large vascular growths. Such telangiectases and small vascular tumors are best observed in the so-called "multiple hereditary telangiectasis of Osler." Simple varices and cysts of blood vessels give rise to reddish or purplish tumors, usually located on the sides of the tongue and lips of the aged, in the latter location giving rise to the familiar "blood blister of the lip."

Cavernous hemangiomas are usually congenital vascular tumors found on the lips of infants, but may occur at any portion of the oral vestibule. They are

*Read in Section on Dermatology and Syphilology, Southern Medical Association, Twenty-third Annual Meeting, Miami, Florida, November 19-22, 1929.

From the Department of Dermatology and Syphilology, Baylor Medical College, Dallas, Texas.

†Reprinted from Southern Medical Journal 23: 979, 1930

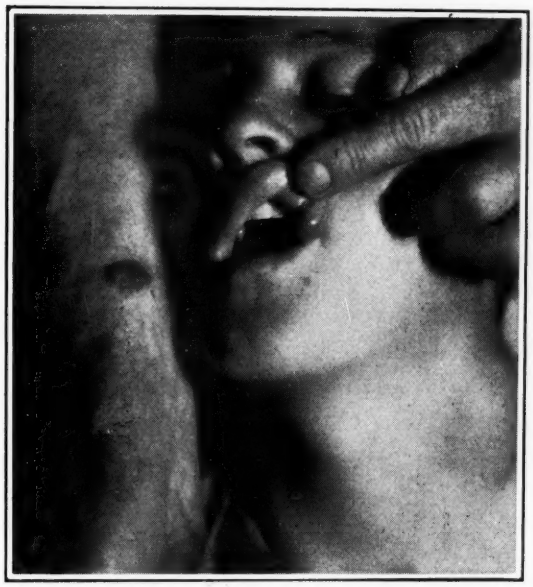


Fig. 1.—Congenital and familial hemangioma of the oral mucous membrane. Patient also shows large blood cyst of the neck. Cavernous hemangioma on forearm of the father. Vascular oral tumors presented in five members of one family in two generations.

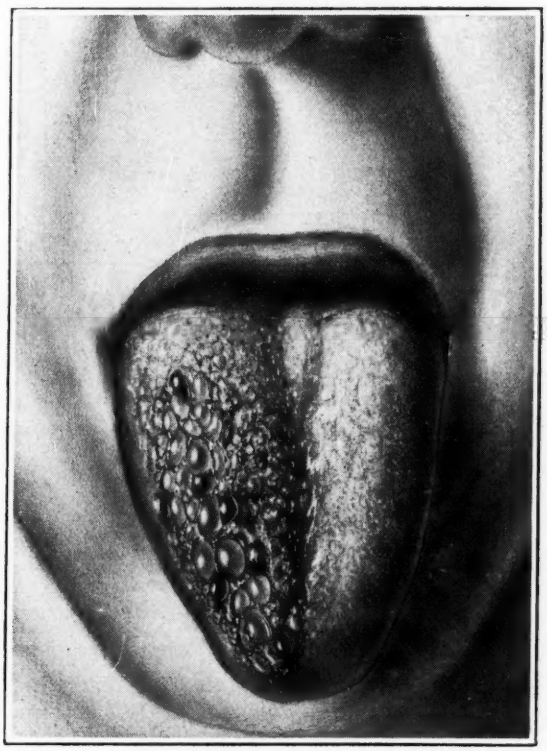


Fig. 2.—Lymphangioma of tongue.

DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of
Sterling V. Mead, D.D.S., Washington, D.C., Director
M. N. Federspiel, D.D.S., M.D., F.A.C.S., Milwaukee.—Vilray P. Blair, M.D., F.A.C.S., St. Louis, Mo.—Theodor Blum, D.D.S., M.D., F.A.C.D., New York.—Leroy M. S. Miner, M.D., D.M.D., Boston.—Wm. L. Shearer, M.D., D.D.S., Omaha.—Frederick F. Molt, D.D.S., Chicago.—Robert H. Ivy, M.D., D.D.S., Philadelphia.—Edward L. Miloslavich, M.D., Milwaukee.—French K. Hansel, M.D., M.S., St. Louis, Mo.—W. M. Reppeto, D.D.S., Dallas, Texas

BENIGN TUMORS AND CYSTS OF THE ORAL CAVITY*†

By Bedford Shelmire, M.D., Dallas, Tex.

ALMOST every benign tumor found in the human body may have its analogue in the oral cavity. Among these may be included tumors of the vascular system, fibromas, lipomas, neuromas, neoplasms of smooth and striped muscle, dermoids, and the like. In addition, neoplasms derived from the dental system, as adamantinomas, epulides, odontomas, and the various dentigerous cysts, are encountered solely in this cavity.

ANGIOMAS

Angiomas are tumors in which the blood or lymph vessels constitute the most prominent part. Where blood vessels predominate, such tumors are called hemangiomas; where lymph channels constitute the chief portion of the growth, the tumors are designated lymphangiomas. Where both blood and lymph vessels compose such tumors, the term hematolymphangioma is applied.

Simple telangiectases occur anywhere in the oral cavity, especially on the vermilion borders and adjoining mucous surfaces of the lips and on the tips and sides of the tongue. Here they occur as simple capillary dilatations or pinhead to large vascular growths. Such telangiectases and small vascular tumors are best observed in the so-called "multiple hereditary telangiectasis of Osler." Simple varices and cysts of blood vessels give rise to reddish or purplish tumors, usually located on the sides of the tongue and lips of the aged, in the latter location giving rise to the familiar "blood blister of the lip."

Cavernous hemangiomas are usually congenital vascular tumors found on the lips of infants, but may occur at any portion of the oral vestibule. They are

*Read in Section on Dermatology and Syphilology, Southern Medical Association, Twenty-third Annual Meeting, Miami, Florida, November 19-22, 1929.

From the Department of Dermatology and Syphilology, Baylor Medical College, Dallas, Texas.

†Reprinted from Southern Medical Journal 23: 979, 1930

Fig. 1.—Congenital and familial hemangioma of the oral mucous membrane. Patient also shows large blood cyst of the neck. Cavernous hemangioma on forearm of the father. Vascular oral tumors presented in five members of one family in two generations.

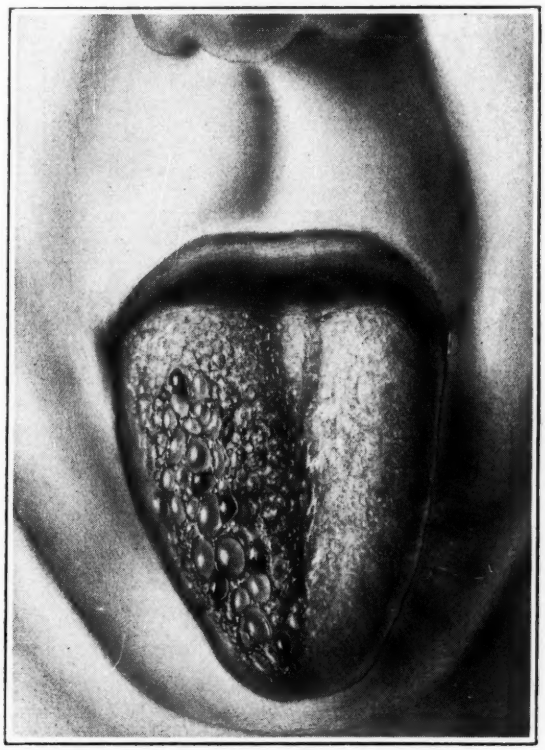


Fig. 2.—Lymphangioma of tongue.

reddish or bluish, soft, spongy tumors which microscopically resemble erectile tissue. All start and spread as capillaries. As a nevus of this type progresses, the interstitial tissues between the capillaries break down, giving rise to larger and wider blood spaces, so that the older parts of the tumor become cavernous. If the endothelial elements break down extensively, the blood spaces become wider, occasionally giving rise to large blood cysts. In addition to this type of hemangioma observed in the mouths of infants, more complex familial and hereditary vascular tumors may be encountered in the oral vestibule, in association with similar tumors on the cutaneous surface and deep blood cysts of the neck (Fig. 1).

Lymphangiectases and cavernous lymphangiomas are identical in structure with the hemangiomas, except that in the former instance the growths are composed of dilated lymph channels instead of blood vessels. Tumors of this type are bluish-white irregular elevations composed of droplet-like bodies (Fig. 2). Cystic or varicose dilatation of the lymph vessels of the oral cavity may

Fig. 3.—Verruca vulgaris of the lip. Lesion was apparently an autoinoculation from similar verrucae on fingers.

occur, especially on the lips and cheeks. More diffuse forms of lymphangioma occur as uniform marked enlargements of the lips and tongue, known as lymphangiomatous macrochilia and macroglossia. These, however, are not true neoplasms, as the tumor-like swellings of the tongue and lips in these instances are due to lymphatic hypertrophy.

Lymphangiomatous swellings of the lip following repeated inflammatory processes in this structure are of a similar nature.

PAPILLOMA

The papilloma is probably the most frequently observed tumor of the oral cavity. It occurs anywhere on the oral mucous membrane and varies from a pea-sized to an extensive verrucous growth, bleeds readily, and is subject to ulceration. The favorite sites for such growths are the tip of the tongue, gums, region of the uvula and pillars of the fauces. Histologically, they appear as loose fibrous connective tissue covered with stratified, squamous epithelium, revealing various degrees of hyperplasia. Many of the papillomatous prolifera-

tions in the oral cavity are hyperplastic structures due to chronic irritation, that is, verrucous leucoplakia, papillomatous polypi, and papillomatous growth about chronic ulcers.

Verrucae (warts), associated with similar lesions on other portions of the body, occasionally occur on the oral mucous membrane. The theory that verrucae are caused by a filterable virus and that oral lesions result from auto-inoculation seems to have been conclusively proved. The pointed wart, verruca acuminata, occurs on the oral mucous membrane in association with the acuminate condyloma (venereal wart) on the genitalia. Filiform warts of the mouth occur in association with filiform verrucae of the face. The common wart or verruca vulgaris of the oral cavity occurs most frequently in association with similar lesions on the hands, usually in children. The oral lesion is probably an auto-inoculation brought about by the child's habit of continually biting or sucking such lesions on the fingers or hands (Fig. 3).

Fig. 4.—Hard fibroma of mucous surface of upper lip.

FIBROMATOUS TUMORS

Simple Fibromas.—These benign tumors of connective tissue origin are of rather frequent occurrence in the oral cavity. In cases of von Recklinghausen's disease, they may be multiple. As a rule, such growths are single, of the color of normal mucous membrane, sessile or pedunculated, soft or hard, range in size from a pea to a hen's egg, are submucous or hang down into the oral vestibule (Figs. 4 and 5). They occur particularly on the cheeks, dorsum of the tongue, soft palate and gums. Soft, hard and intermediary types occur. Microscopically, the soft fibromas have a loose connective tissue structure rich in cellular elements, and the strands of connective tissue are separated by spaces filled with a serous fluid. Externally, they are covered with stratified squamous epithelium of the mucous membrane. Hard fibromas consist of densely packed, coarse bundles of fibrous tissue, with cellular elements few in number. Transition forms between the soft and the hard fibroma, and the mixed types, are the rule.

Keloids.—The various essayists on diseases of the oral cavity make no distinction between fibromas and keloids. Histologically, the hard fibroma and the keloid cannot be differentiated, unless the orderly arrangement of the densely packed connective tissue bundles of the latter serve as a means of differentiation. Clinically, a real difference does exist. Fibromas, both soft

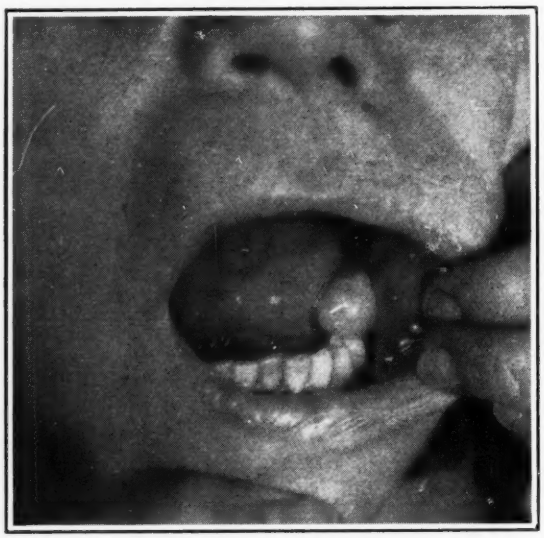


Fig. 5.—Soft, pedunculated fibroma. Tumor contained much myxomatous tissue.

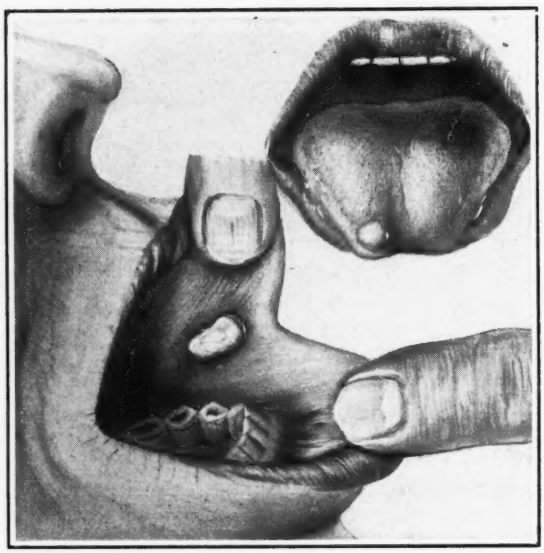


Fig. 6.—Keloids. Lesion on tip of tongue followed removal of papilloma with the electric needle. Buccal keloid followed laceration from a tooth.

and hard, are spontaneous tumors of the oral mucous membrane. Keloids of the oral cavity may be spontaneous but usually have an antecedent history of trauma, and are most frequently found in connection with keloids on the cutaneous surface. Keloids in the oral vestibule not infrequently follow the electrolysis of a small papilloma with the electric needle, injury of the mucous membrane from a sharp tooth, or ulceration. This apparently explains the site

of predilection of these neoplasms, the buccal mucous membrane along the occlusal line of the teeth and the tip of the tongue (Fig. 6). Another feature of the oral keloid not characteristic of the fibroma is that it tends to recur after surgical removal. This tendency often leads to an erroneous diagnosis of malignancy. Irradiation with radium, or surgical removal followed by radium, is the procedure of choice in the treatment of these tumors.

SIMPLE GRANULOMAS

Granuloma Pyogenicum.—Pyogenic granulomas, identical with those occurring on the glabrous skin, may occur at any portion of the oral vestibule. The favorite sites for such tumors are the vermilion borders and mucous sur-

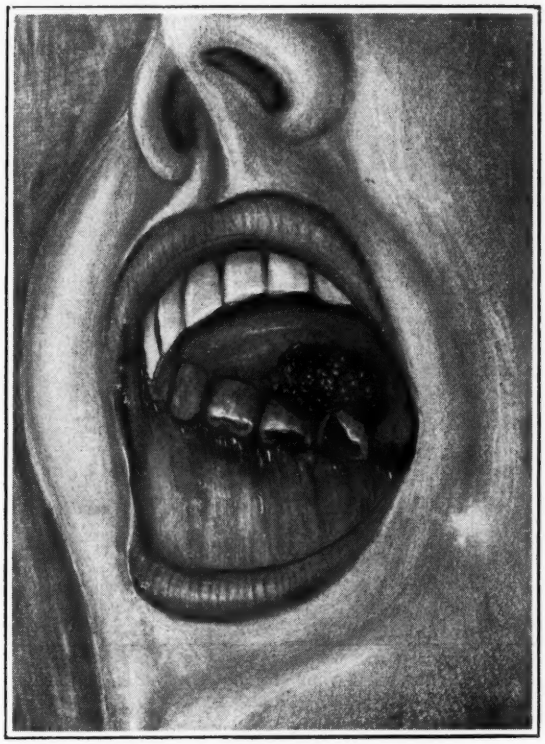


Fig. 7.—Gingival granuloma.

faces of the lip, and the tip of the tongue. They appear as pea- to cherry-sized, pedunculated, mushroom-like tumors. On the vermilion border of the lips, these tumors are reddish or purplish in color. On the mucous membrane proper, their color varies from a pale red to pink, because their covering epithelium becomes sodden from heat and moisture. In rare instances they may be greyish in color. Such tumors, composed of rapidly proliferating granulation tissue, bleed freely if traumatized and readily recur if not thoroughly removed.

Gingival Granulomas.—Soft, beefy, pea- to cherry-sized granulomatous tumors situated along the gingival borders of the gums, common to a dental practice, are occasionally referred to the dermatologist for diagnosis. These tumors, etiologically and pathologically, are identical with the granuloma pyogenicum

of the glabrous skin except that the gingival granuloma presents a peculiar feature not found elsewhere in the body, namely, strands of proliferating epithelial cells deep in the granulomatous mass. These proliferating epithelial cells may occasion a diagnosis of malignancy by one not versed in the peculiarities of the tissue. They are, however, the result of hypertrophy of epithelial dental rests. Such granulomas are absolutely benign and are the direct result of infection, usually from a tooth pulp or apical granuloma. They gain entrance into the oral cavity through the space between the tooth and the gum. On extraction of the infected tooth, the adherent granuloma is often removed (Fig. 7).

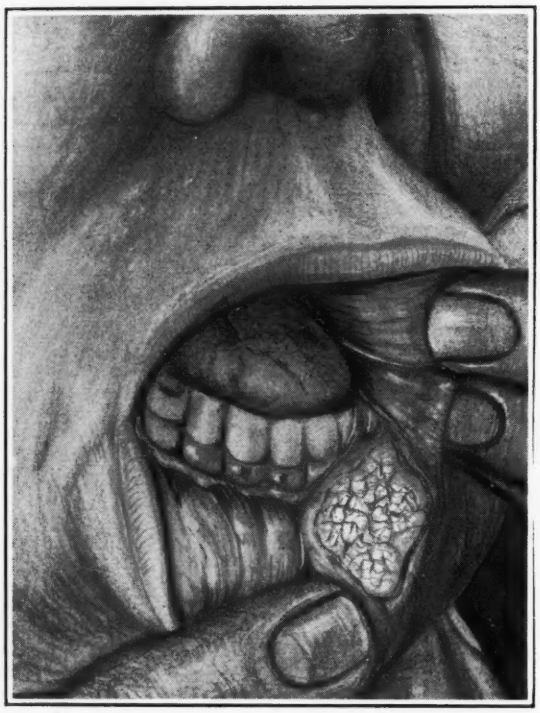


Fig. 8.—Lipoma. Section showed tumor to be composed entirely of adipose tissue.

LIPOMAS

True lipomas of the oral cavity are very rare. Most of the recorded cases have been soft, yellowish, globular, and lobulated masses of extremely slow growth. They are the most benign of all oral neoplasms but may cause considerable mechanical disturbance through their size. Such tumors are usually single, yet multiple lipomas have been observed on the floor of the mouth. The sites of predilection for such growths are the dorsum of the tongue, cheeks and palate. In most instances the adipose tissue is combined with myxomatous, chondromatous, or fibrous tissue, and according to the preponderance of one or the other tissue, such mixed tumors are called lipofibromas, or fibrolipomas, myxolipomas or lipomyxomas, etc. Many cases of pedunculated lipoma of the tongue are on record. Some were extensive sausage-shaped growths which extended backward into the pharynx and could be regurgitated by the victim. Lipomas of the floor of the mouth have usually been erroneously diagnosed as

dermoids. Several cases of congenital lipoma of the oral vestibule have been recorded, but in almost every instance these have later been proved congenital tumors of mixed tissue formation.

Only one example of true lipoma of the oral cavity has been observed in our practice. The yellowish, cherry-sized tumor of the lower lip depicted in Fig. 8 was removed for microscopic study. This proved to be a lobulated mass of adipose tissue with sparsely scattered connective tissue trabeculae holding together the individual lobules of fatty tissue. The entire mass was, in turn, surrounded by a very thin connective tissue capsule.

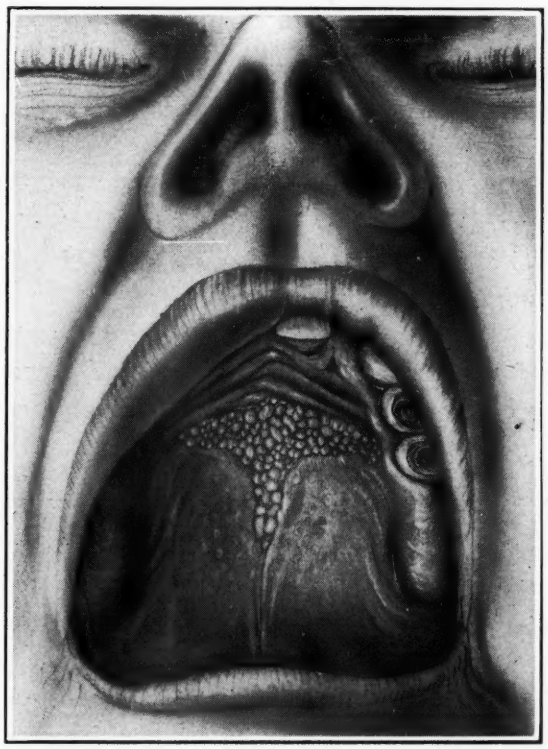


Fig. 9.—Adenomas of the mucous glands of the palate. Diagnosis was verified by microscopic study of removed tissue.

ADENOMAS OF THE ORAL CAVITY

Adenomas of the oral cavity occur as two distinct forms, the one giving rise to small pinhead to pea-sized tumors of the palate; the second causing large, clumsy swellings of the lips, macrochilia, the so-called "double lip" of European writers, and cheilitis glandularis apostematosa.

Adenomas of the Palate.—Contrary to the various texts on diseases of the mouth, adenomas of the palate are among the most frequently observed oral tumors. They may be single or multiple. When multiple, they frequently become confluent, giving rise to a single tumor, which may cover the entire palatine surface. Individual tumors rarely exceed in size a small pea. Their color is the same as that of the surrounding mucous membrane. In certain instances, and especially in the larger tumors, there is a depression at the duct opening, which is surrounded by a distinct erythematous halo. Sections show

these growths to be composed almost entirely of mucous glands with a varying amount of connective tissue. Such tumors are benign but tend to recur unless completely removed. I have seen one such pea-sized tumor recur three times after what was considered complete removal by electrodesiccation. As a rule, treatment of these growths is not indicated (Fig. 9).

Macrochilia (Double Lip).—In this, one or both lips show a uniform marked enlargement. The overlying mucous membrane is smooth, intact, without folds, furrows or elevations, and without any evidence of inflammation. Such tumor-like swellings of the lip have usually been diagnosed as lymphangiomatous macrochilia. On cross-section, such tumors have been found to be composed of a multitude of small lipoma-like bodies up to the size of a cherry pit. Histologically, they are like unaltered mucous gland tissue. In some of the reported cases, palpable nodules were observed beneath the normal mucous membrane.

Cheilitis Glandularis Apostematosa.—This is a term applied to a chronic adenomatous enlargement of the lip, due to inflammation of the mucous glands. Clinically, the affection is characterized by a thickened, edematous, inflammatory condition of one or both lips, and prominence of the gland orifices. The lip is enlarged, everted, often painful, the surface is crusted, and small cysts and abscesses are frequent. Microscopically, the mucous glands and their ducts are hypertrophied, the connective tissue is increased, and there is a cellular infiltration of small lymphocytes.

BENIGN GIANT CELL TUMORS (SO-CALLED EPULIS)

The term of epulis has, in the past, been loosely used to imply any periosteal tumor on the alveolar process, regardless of its histologic structure. Today, usage has limited the term to designate two types of tumors, the fibrous type, or epulis fibromatosa, and the giant-cell type, or epulis sarcomatosa. It is in the latter sense alone that the term is used by many authors. These giant-cell tumors are benign, yet show a marked tendency to recur. Such recurrences are always local, and there is no tendency toward generalization. They are of slow growth except in pregnancy, when rapid increase in size may ensue. As a rule, such neoplasms are located on the labial and buccal side of the alveolar process, only rarely being observed on the lingual and palatine side.

Epulis Fibromatosa.—This type of epulis is usually small, firm, and the color of the surrounding mucous membrane. Such tumors are as a rule, sessile, but may be pedunculated and hang down into the oral cavity. Ulceration often occurs. They are tough and gritty to the cutting knife. Pathologically, the younger forms are made up of new connective tissue, rich in cellular elements; the older tumors are composed almost entirely of dense connective tissue.

Epulis Sarcomatosa.—The giant-cell type of epulis may be firm and hard but is usually soft and spongy to the touch. These tumors may be the color of normal mucous membrane or deeply cyanotic in hue, depending upon the vascular elements present. Microscopically, they are found to be composed of interlacing spindle-cells with varying numbers of large multinucleated giant

cells of the foreign body type. Clinically, and pathologically, many transition forms are found between the fibrous form and the giant-cell type (Fig. 10).

MIXED TUMORS OF THE PALATE

Mixed tumors, identical pathologically with the "mixed tumors of the parotid gland," are occasionally observed on the palate. Like tumors have been observed in the cheeks, nose, lips, lobule of the ear, and more remote portions of the body. Such neoplasms of the palate are discovered accidentally, or because of their size, deglutition is rendered difficult and the patient seeks a physician's aid. These neoplasms are usually of slow growth, vary in color

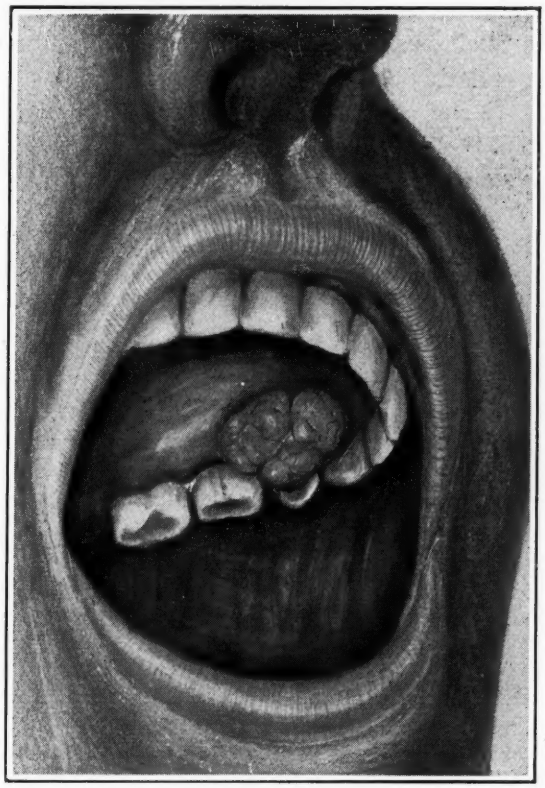


Fig. 10.—Epulis sarcomatosa (histological examination).

but slightly from the normal mucous membrane, and do not tend to recur after surgical removal (Fig. 11). They are always found to one side of the median line and are therefore easily distinguishable from the midline torus palatinus, an exostosis covered with normal mucous membrane.

Pathologically, these tumors are of the mixed type, and may contain fibrous, myxomatous, lipomatous, chondrous, and cellular tissue, and are indistinguishable from like tumors found in the parotid gland.

CONGENITAL TUMORS OF MIXED TISSUE

Congenital mixed tumors of the tongue have occasionally been observed. These arise in connection with the median raphe and septum, which in the lower animals, may contain cartilaginous and osseous tissue. Most of the

recorded examples have been parasitic monsters, the tongue being transformed into a huge sac containing bony and cartilaginous masses, skin, hair, lumps of fatty tissue and cysts full of fluid. Some few of these tumors have been noted at birth, but did not begin to grow until adult life, and then sometimes did not surpass in size a pigeon's egg. Pathologically, they are in the class of fetal remnants.

CYSTS

Cysts occurring in the oral cavity may be divided into those of the soft parts and those of the bony parts. The former group includes the simple mucous retention cyst, retention cysts of the tongue (Blandin's gland), ranulae, thyroglossal cysts and dermoids. The latter group includes cysts of the dental and alveolar regions, such as periosteal, root-cysts, follicular cysts, and so forth, and, naturally, falls strictly in the realm of dentistry.

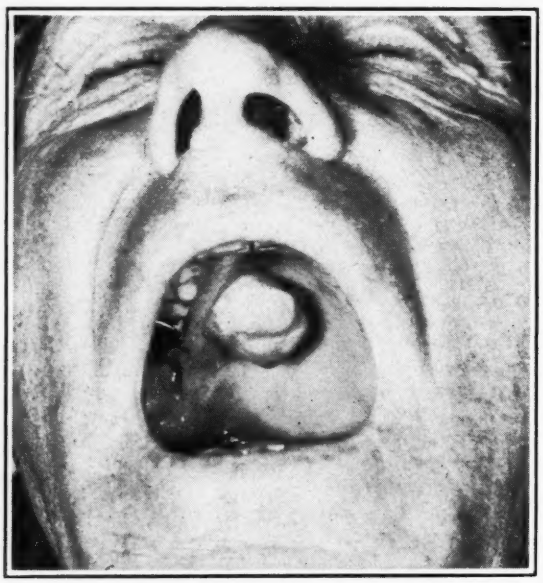


Fig. 11.—Mixed tumor of the palate of the parotid gland type. Base of tumor is to the left of the midline of the palate. Surgical removal and pathologic study of tumor by the Dallas Medical and Surgical Clinics.

Simple Retention Cysts.—These are cystic dilatations of mucous glands or their ducts from retention of normal secretions. Occlusion, or obliteration of the ducts, results from injury at the duct orifices or from inflammatory processes within the glands themselves. Such simple retention cysts may occur anywhere in the mucous membrane of the mouth where glandular structure is found. Since the lips are abundant in mucous glands, and these sites are prone to accident, especially the lower lip, cysts of this type are usually found here. They form protuberances varying in size from a pea to a hazelnut, and have a slate or slightly bluish color due to the serous or mucous contents shining through a thinned mucous membrane. On incision, a glairy, ropy mucus escapes. If the opening is allowed to close, the tumor shortly reappears.

Various methods for destruction of this annoying lesion have been recommended, chiefly because of the fact that recurrences after incomplete removal

are frequent. The most satisfactory procedure is to clip away the bulging roof of the cyst with scissors, allowing the cyst contents to escape. With a pair of mouse-tooth forceps, the many parts of this compound racemose gland are carefully fished out of the resulting small lip cavity. Often several dozen sago-like bodies can be thus extricated. The cavity wall is then lightly desiccated with a unipolar Oudin current to destroy any portions of the gland which may have been overlooked. Healing is prompt and recurrences are rare (Fig. 12).

Retention Cysts of the Tongue.—Occasionally, small cysts are observed on the undersurface of the tip of the tongue to either side of the median line. These swellings rarely surpass a small marble in size, yet larger swellings have occasionally been recorded. They are cystic dilatations of the anterior lingual glands of Blandin following occlusion of their ducts.

Blandin's glands are small collections of glandular structure imbedded in the muscular tissue on the undersurface of the tip of the tongue. They are

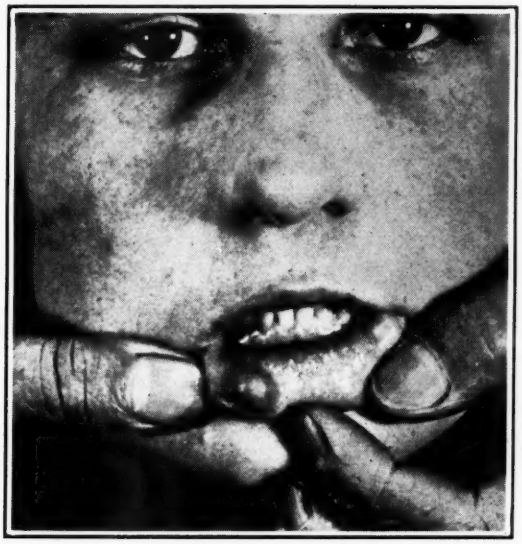


Fig. 12.—Simple retention cyst.

perceptible to the finger if the organ is grasped just behind the tip, and are demonstrable as small almond-shaped bodies if the mucous membrane and a thin layer of musculature is dissected from the undersurface of the tongue just posterior to the tip. Congenital cysts of this type have been reported.

Ranulae.—Ranula is a loose term applied to all cystic swellings on the floor of the mouth, whatever their form or origin. The term here is confined to cystic dilatation of the duct of the sublingual or submaxillary gland. Persistent obstruction to the flow of saliva due to stones or cicatricial occlusion of the outlet leads to the development of a sialocele or cyst-like dilatation of these ducts. They are usually laterally situated tumors, oval, finger-shaped or globular, transparent, tensely filled with a ropy mucous fluid resembling the white of an egg. Their size varies from that of a small marble, to tumors filling the oral cavity and causing swelling in the face and neck. Such cystic tumors must be differentiated from dermoids and thyroglossal cysts in the same locality. In order to prove the patency of the sublingual and Wharton's ducts,

the floor of the mouth should be wiped dry. Dilute acetic acid on a pledget of cotton is then applied to the duct openings. If these ducts are not occluded, a small intermittent jet of saliva will be expelled from these ampullae.

THYROGLOSSAL TUMORS AND CYSTS

Occasionally cysts, or tumors, may be found in the oral cavity from unobliterated portions of the primitive thyroglossal duct. The inferior portion of this duct gives rise to the development of the main portion of the thyroid gland, the central portions obliterate, while the upper end remains to form the foramen caecum of the tongue. Cysts and fistulas in the midline of the neck above the level of the thyroid, formed from unobliterated remnants of this duct, are not extremely rare. Occasionally, cysts of this nature are found on the floor of the mouth, where they are mistaken for ranulae or dermoids. Ranulae are usually not congenital, are bluish in color, are not adherent to the hyoid bone, occupy a lateral position, and transmit light. Closure of the salivary ducts of the affected side can be demonstrated by the application of salt or dilute acetic acid to the duct openings. Dermoids can be differentiated on pathologic grounds alone. The wall of a thyroglossal duct cyst may show stratified squamous epithelium but will lack all skin appendages.

The principal location for these tumors and cysts in the oral cavity is at the base of the tongue, between the epiglottis and the lingual V. Such tumors may be solid, on section resembling normal thyroid tissue. Others are entirely cystic. They have been recorded as varying in size from a pea or a small marble to a hen's egg. Sometimes such tumors are intensely vascular, causing alarming hemorrhage on incision. Solid tumors of this type, containing thyroid tissue, have mostly been encountered in young women showing hypoplasia of the thyroid gland proper. Their removal has often resulted in myxedema in the subject.

DERMOID CYSTS

Dermoid cysts in the oral cavity are ordinarily found in the sublingual region on the floor of the mouth and are usually erroneously diagnosed as ranulae, or, when a swelling is present in the neck, as a deeply placed sebaceous cyst. Dermoids are congenital, but many do not develop until late in life. Instances of infants born with such tumors have been recorded, yet the great majority occur between the ages of twelve and twenty-five years.

These tumors are slightly lighter in color than the surrounding mucous membrane, often having a yellowish hue. They are soft, cystic or elastic, round, oval or dumb-bell shaped; vary in size from a small marble to an orange or larger; are freely movable in all directions, and on the deeper parts. Pitting may be present on palpation.

Exploratory puncture will usually make the diagnosis, for aspiration of sebaceous contents points to either a dermoid or a thyroglossal cyst. These two tumors cannot be differentiated clinically, the ultimate diagnosis being possible only after pathologic study of the cyst contents or wall.

The contents of a dermoid are, as a rule, characteristic, and from these a positive diagnosis of an epithelial lined cyst may be made. They are whitish

or yellowish in color with a consistency varying from a thick liquid to a cheesy mass, through which lanugo hair may be scattered. The contents are oily in nature, often having a rancid odor, and if examined microscopically, desquamated epithelial cells, fat droplets, cholesterin and even hair of the lanugo type may be found.

On microscopical examination, the cyst wall is found to be lined with stratified squamous epithelium and shows skin appendages. For positive diagnosis of this cyst the presence of these dermal appendages is necessary. Just as there are certain areas of the skin without hair follicles, and with but few sebaceous and sudoriferous glands, so it is not unusual to find the dermoids lacking in some of the appendages of the true skin. The epithelium may be reduced through desquamation to a few layers, but, as a rule, is lined with stratified squamous epithelium with a stratum corneum and stratum malpighii.

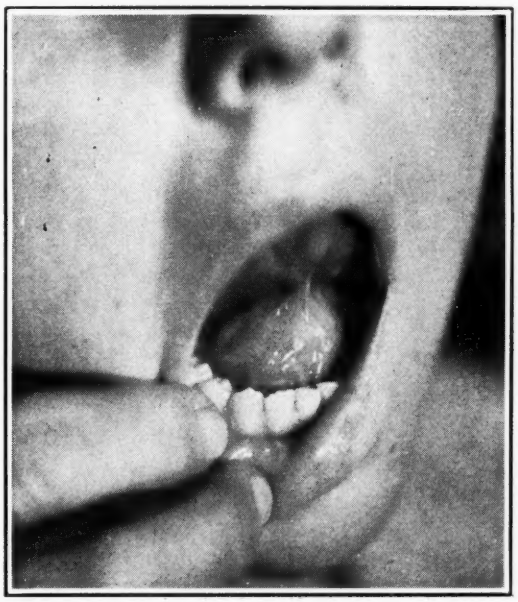


Fig. 13.—Dermoid cyst. Contents cheesy. Microscopic study revealed skin appendages in cyst wall.

While hair follicles may not be present, sebaceous and sweat glands are usually found in great abundance. Pathologic examination of the cyst walls of the two cases reported here, showed in the one, many sebaceous and sudoriferous glands, while in the second, sebaceous glands alone could be demonstrated. The presence of this one appendage of the true skin sufficed to make a positive diagnosis (Fig. 13).

ADAMANTINOMAS

Adamantinomas are true tumor formations, apparently arising from the peridental epithelial débris. They are solid, or cystic neoplasms arising within the alveolar border. By slow growth they gradually distend the ramus of the jaw, often reaching enormous size to project into the oral cavity. The solid type, more commonly found in the maxilla, usually consists of epithelial islands surrounded by high columnar cells, cystic cavities from degeneration of such

epithelial islands, enameloblasts and a connective tissue stroma. The cystic types, usually found in the mandible, are either unilocular or multilocular. These cysts are lined with columnar epithelium and contain considerable serous or mucous fluid. Adamantinomas are of a low degree of malignancy but are slowly progressive and have a marked tendency to recurrence after removal (Fig. 14).

ODONTOMAS AND DENTIGEROUS CYSTS

These are not true neoplasms, but rather manifestations of improper dentition. For descriptions of such tumors the reader is referred to works on dental pathology.

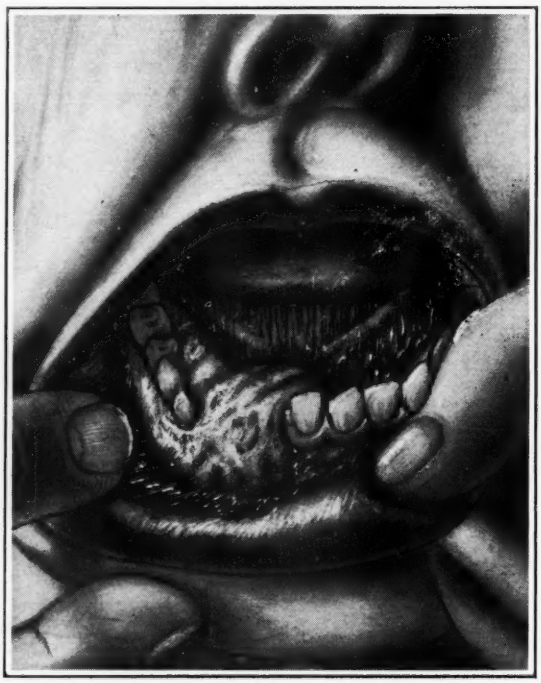


Fig. 14.—Adamantinoma of the mandible. Tumor was of the solid type, composed almost entirely of enameloblasts. Patient of Dr. A. C. Sloan.

RARER TUMORS OF THE ORAL CAVITY

Among the rarer benign neoplasms of the oral vestibule may be mentioned neuromas, myomas, chondromas and osteomas. True neuromas may occur as amputation neuromas, but, as a rule, they appear as neurofibromas, especially in general neurofibromatosis (Recklinghausen).

Myomas.—Myomas belong to the rarest of oral tumors, and the few recorded cases have mostly been leiomyomas. Some smooth muscle tissue is not infrequently found in the mixed tumors, such as the fibromyomas. Simple muscular hypertrophy, or hyperplasia, in the oral cavity is not rare. This occurs especially in the tongue, giving rise to the simple muscular macroglossia. To a slight extent this condition is characteristic of some forms of mental deficiency, as in cretins, mongols and some idiots. Mixtures of muscular and lymphangiomatous hypertrophy may occur.

Osteomas.—Genuine osteomas are exceedingly rare. Most of the so-called osteomas are in reality malformations, or hyperplasias, due to trauma or inflammatory processes of the bony parts of the oral cavity. The most frequent of these is the torus palatinus, a simple exostosis on the median line of the hard palate (Fig. 15).

Chondromas.—True chondromas are as infrequent invaders of the oral cavity as the true osteomas. Chondromatous tissue in the oral cavity is usually observed in the mixed tumors.

Tumors of molluscum contagiosum may be found in the oral vestibule, usually in connection with like growths on the cutaneous surface. Such tumors on the oral mucous membrane rarely exceed in size a cherry-pit, though lesions double this size have been recorded. They are greyish in color and tend to ulcerate early. The buccal surface of the cheek is the site of predilection.

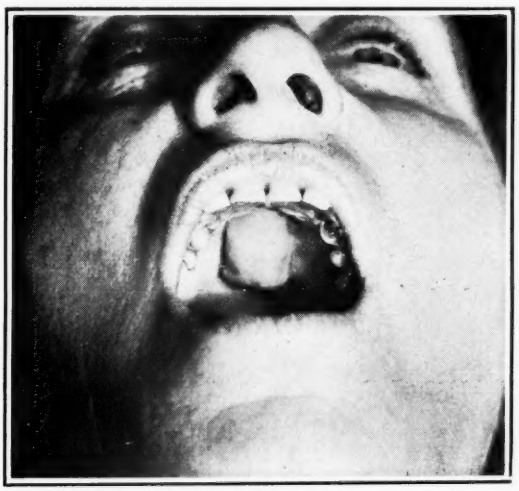


Fig. 15.—Torus palatinus. An exostosis in the midline of the palate covered with normal mucous membrane.

Benign hemorrhagic sarcomas of the Kaposi type have been observed in the oral vestibule, usually in association with similar cutaneous lesions.

Verrucous superficial growths of the oral mucous membrane may be noted in association with ichthyosis hystrix.

DISCUSSION (ABSTRACT)

Dr. Andrew L. Glaze, Birmingham, Ala.—Shelmire's outstanding contributions to this branch of dermatology are already regarded as classics, and the large and almost unique group of rare photographs and drawings he gives us here will add distinction to his work and credit to the Section.

Dr. Udo J. Wile, Ann Arbor, Mich.—I want to express my appreciation of these extraordinary photographic illustrations. We have no illustrations, so far as I know, except the photographs of the late Dr. Fordyce and the late Dr. McKee to show what the lesions of the inside of the mouth look like. Anyone like myself, who, during many years has tried to get good photographs, knows with what difficulty such procedure is fraught. Dr. Shelmire's photographs are almost diagrammatic in their accuracy.

The only textbook that I know of an diseases of the mouth is Bucklin's book, which contains a lot of diagrammatic paintings and drawings, and our own textbooks are woefully weak in these things.

Dr. I. R. Pels, Baltimore, Md.—We see occasional growths in the mouth which give us considerable concern on account of the possibility of malignancy.

Dr. E. S. Lain, Oklahoma City, Okla.—I wish to ask Dr. Shelmire to tell us from his experience, under what conditions a verruca of the mouth, particularly of the tongue, may become malignant.

Dr. Shelmire (closing).—This paper, along with the one presented two years ago, was offered with the hope of stimulating interest in this sadly neglected field. With papers to follow from men of our own Section and from those of other fields of medicine, the hybrid types of benign tumors of the oral cavity will be classified and your questions will have been answered. I must confine my feeble efforts to a mere delineation of the now recognized varieties.

POLYCYSTIC ADAMANTINE EPITHELIOMA, WITH RESECTION OF THE MANDIBLE. A CASE REPORT

By J. Orton Goodsell, Jr., D.D.S., Saginaw, Mich.

THE patient, a young colored woman, age twenty-three years, first reported at the office on October 22, 1930. She was referred because of a hard mass on the right side of the mandible at the angle. It was dense and appeared as a part of the bone, protruding laterally and being comparable in size to a hemisphere of a small orange. There seemed to be a slight crackling of thin-walled bone upon manual pressure, but essentially the mass was hard and dense. Intraorally there was some expansion medially and superiorly, but the mucous membrane was not broken down and appeared normal in color. The surface of the tumor was convoluted. She declared that the mass had been present since she was twelve years old and had been growing slowly ever since. In March, 1929, an attempt was made intraorally to remove the growth, and a few months later she received a blow on the jaw. Apparently these things produced a more rapid proliferation and degeneration because she reports the rate of development to be increased since the injuries. The tumor, for the most part, produced no pain, but on occasions, she asserted, there was some discomfort of a referred nature but no tenderness.

The differential diagnosis very evidently must consider sarcoma or adamantinoma. Roentgenograms were obtained (Fig. 1) and a preliminary diagnosis of adamantinoma was made.

Two days later a biopsy was done, intraorally under local anesthesia, and the preliminary diagnosis was confirmed by a report of polycystic adamantine epithelioma (see laboratory report).

On November 13 the patient was admitted to the oral surgery service of the Saginaw General Hospital, and the following is the preoperative record:

Physical.—Essentially negative. Eyes and throat normal; teeth in fair condition, but a few roots present; no enlargement of glands or thyroid; lungs—no impairment of expansion, resonance or breath sounds, no râles heard; heart—not enlarged to percussion, no disturbance of rate or rhythm and no murmurs; abdomen and extremities negative; blood pressure 86 over 48; temperature normal.

Urine.—Light amber; specific gravity—1.035; acid; albumin—a trace; negative for sugar, acetone, diacetic and bile; numerous epithelial cells and occasional white blood cells.

Blood.—Hemoglobin, 80 per cent; white blood count, 6,400; reds, 4,780,000; 68 per cent polymorphonuclears, 26 per cent lymphocytes, 2 per cent large mononuclears, 4 per cent eosinophiles. Wassermann, 4 plus.

The patient was in the hospital four days before operation, and during that time she received a mouth wash of 1-5000 potassium permanganate thrice

daily, and the teeth and investing tissue were swabbed with hydrogen peroxide each morning and night. On the day before operation the patient developed a generalized adenitis without a rise in temperature or glandular tenderness. It was therefore deemed wise, in view of the positive Wassermann test, to administer neosalvarsan as a prophylactic for the operator if not for the patient.

Anesthesia.—Morphine, gr. ¼, and atropine, gr. 1/150, were given preoperatively and repeated after one hour's operating time. Two per cent novocaine was used to block off the third division of the fifth nerve at the mandibular foramen and also the lingual and long buccal nerves. The skin was anesthetized by infiltration down from the symphysis on a line over the anterior belly of the digastric and up the sternomastoid to a point just under the lobe of the right ear. Further infiltrations in advance of the surgery were used

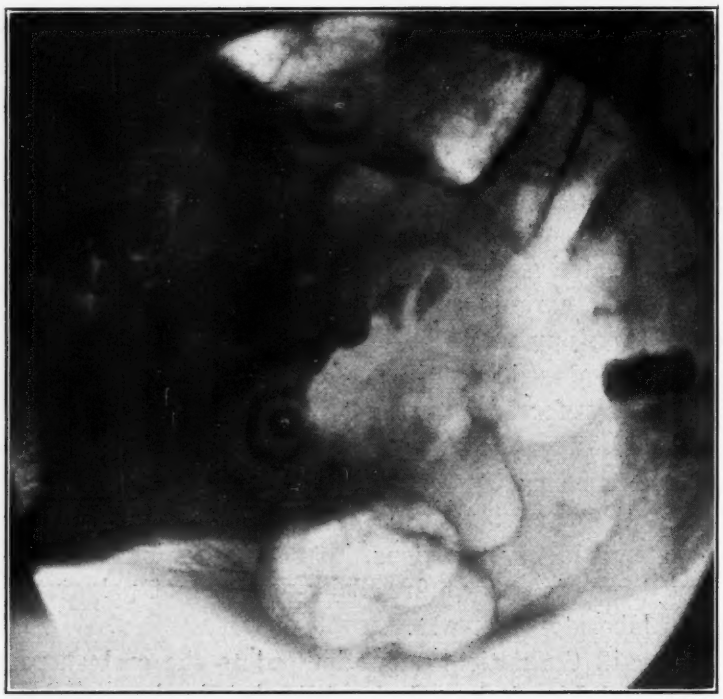


Fig. 1.—The original x-ray picture. Note the extent and the multilocular nature of the bone destruction, with the small cyst high on the anterior border of the ramus, and the unerupted tooth. It appears that this roentgenogram contains a view of practically the entire growth.

as indicated. The patient, whose cooperation was excellent, received gr. 1/100 of hyoscin, subcutaneously, during operation, and the combination of anesthetic agents eliminated all pain. In fact she dozed during most of the time she was on the table.

Operation.—The operative field was prepared with alcohol and iodine and isolated by sterile drapes.

We intended to eliminate the neoplasm without a complete resection by means of cauterization and curettage if it were at all possible. So, with that in mind, an incision which could be extended into a complete resection opening, was made low down under the angle of the mandible. The skin, subcutaneous tissue, and platysma were divided and retracted until the lateral side of the

mandible and tumor was exposed. At this time the facial vessels were tied off and two enlarged lymph glands removed from the submaxillary triangle. The neoplasm was found to be very extensive medially, and the bone was almost completely destroyed, so it became apparent that the only means for

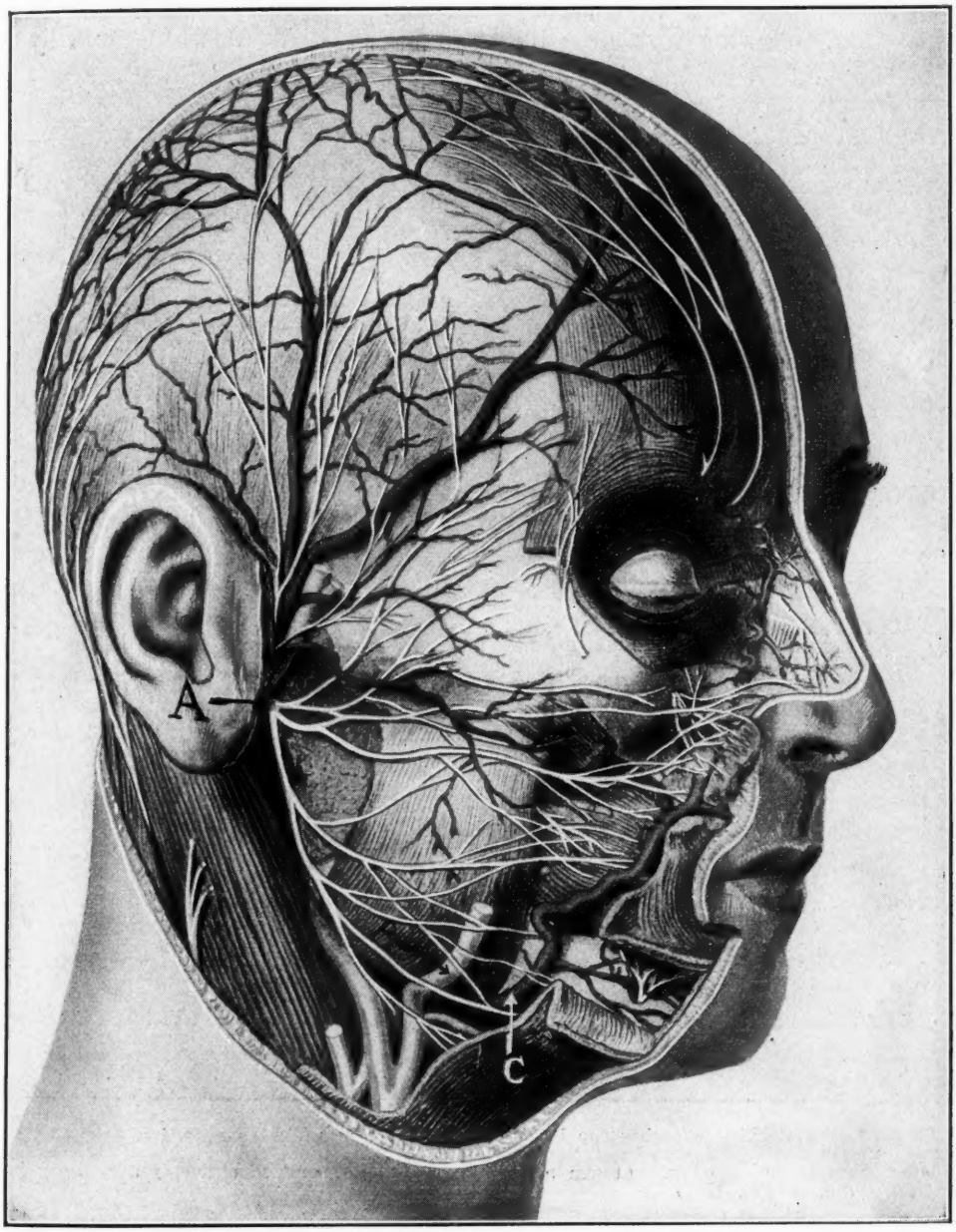


Fig. 2.—Anatomical drawing of the external tissues and structures encountered in mandibular resection. The illustration shows the seventh nerve (*A*), facial artery and vein (*B* and *C*), masseter, parotid, platysma, etc. (From Silverman, *Principles and Practice of Oral Surgery*, P. Blakiston's Son & Co., Inc.)

complete eradication lay in resection and removal of the right half of the mandible. Therefore the incision (Fig. 3) was lengthened distally along the sternomastoid to a point under the lobe of the right ear and anteriorly and superiorly through the lip and down to the bone at the midline. The mandible,

after being exposed by blunt and sharp dissection (Fig. 4), was separated lingually and buccally from the periosteum, and the masseter muscle was detached at its insertion (Fig. 5). The canine tooth was then removed and the bone cut through at that point with a Gigli saw (Fig. 6). By forcibly depressing the mandible we discovered the internal pterygoid and severed it at its insertion, following which the tissue on the oral side was separated by the use of the cautery knife. As the insertion of the temporal muscle came into

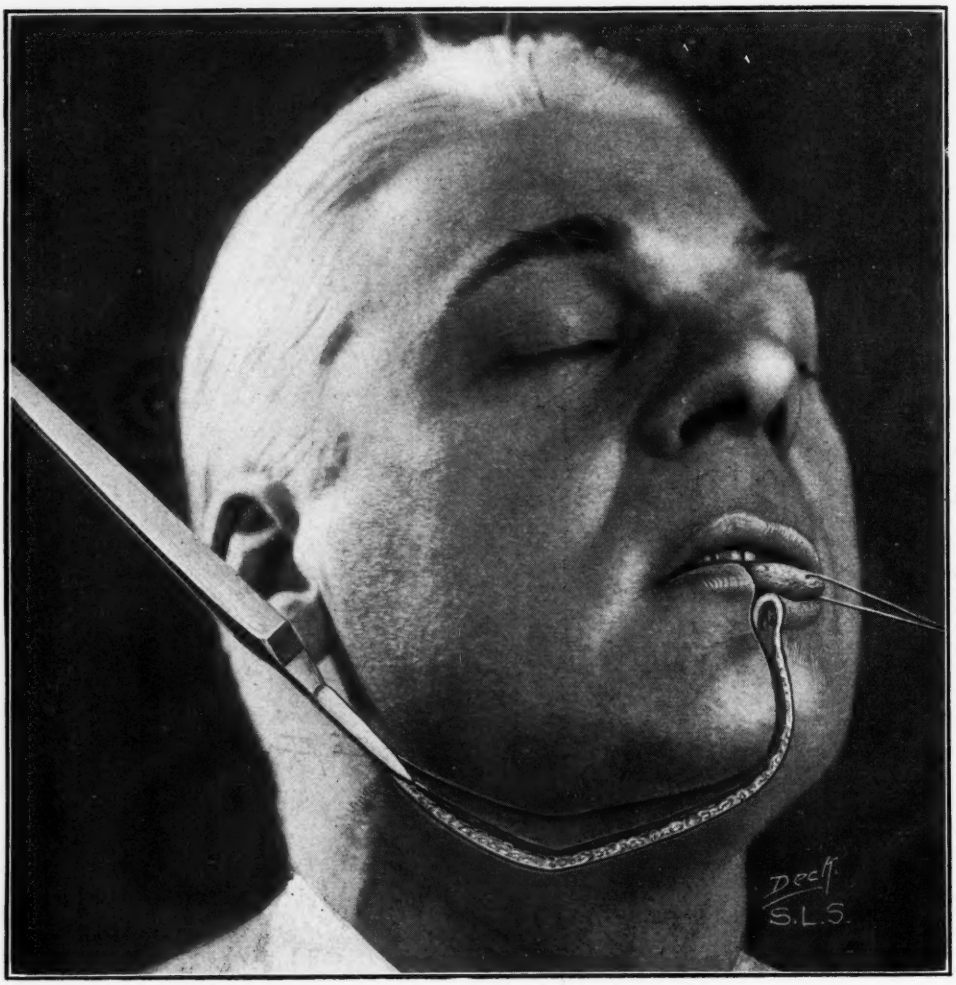


Fig. 3.—Illustration showing the line of incision for mandibular resection—straight down to the bone through the lip at the symphysis, and through the skin, subcutaneous tissue and platysma from there on back. (From Silverman, *Principles and Practice of Oral Surgery*, P Blakiston's Son & Co., Inc.)

view, it was dissected from the coronoid process. Keeping in mind the proximity of the internal maxillary artery (Fig. 7) we divided the external pterygoid muscle close to the neck of the condyle. The capsule of the articulation was then incised on the lateral surface and the condyle enucleated from its fossa, thus removing the last attachment to the bone and completing the removal of the jaw (Figs. 7, 8, and 9). The sharp margins of the remaining butt end of the bone were rounded off by means of files and chisels.

All during the operation numerous small vessels were ligated with catgut, among them the mandibular and mental arteries. The lingual mucous membrane was approximated with interrupted catgut, the platysma and fascia were approximated with catgut, and the skin with interrupted horsehair sutures. The teeth on the left side were ligated, superio-inferiorly, with bronze wire so

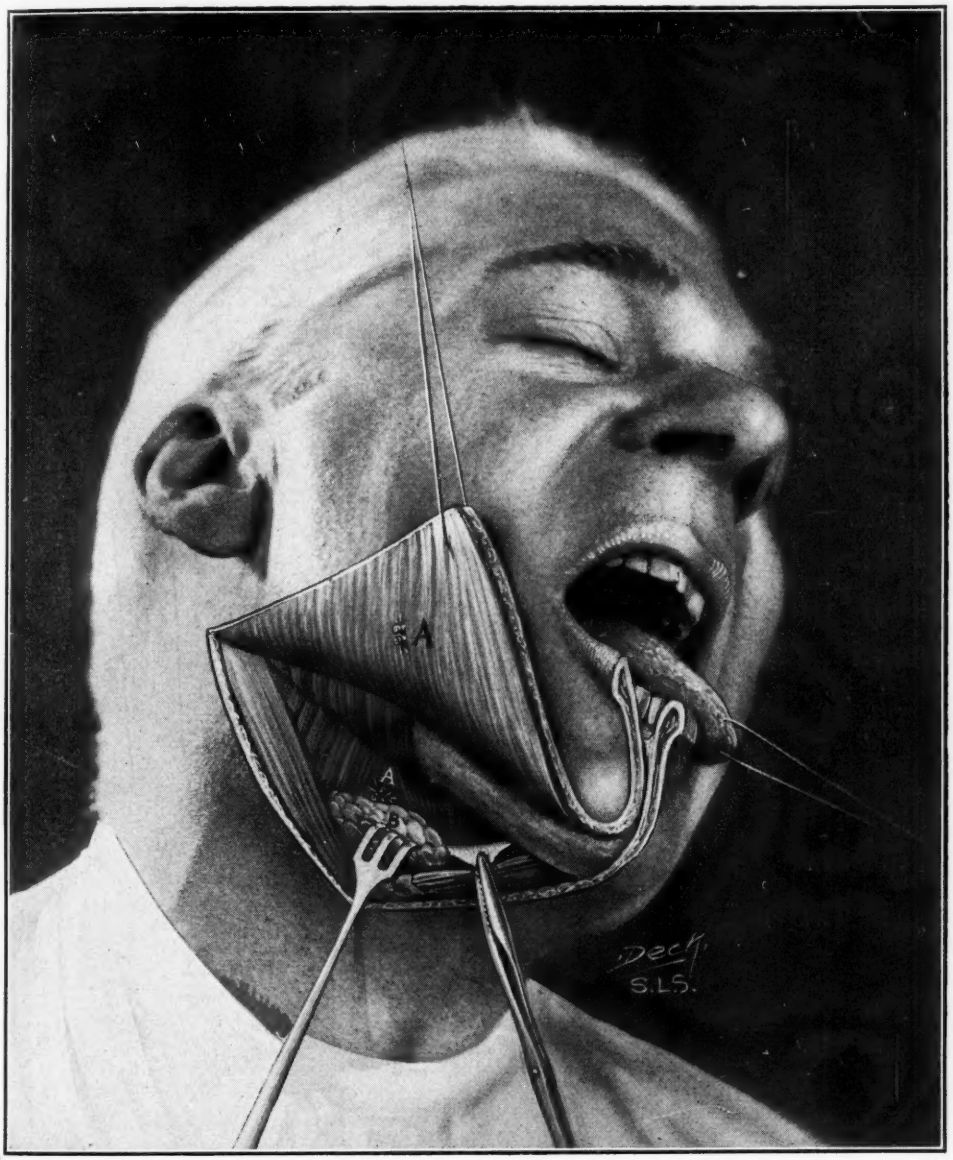


Fig. 4.—Showing the platysma, fascia, subcutaneous tissue and skin retracted and elevated. The submaxillary gland has come into view as well as the masseter. The facial vessels have been cut and tied. (From Silverman, *Principles and Practice of Oral Surgery*, P. Blakiston's Son & Co., Inc.)

as to hold the remaining half of the mandible in position during scarification and healing. Iodoform gauze was placed in the wound intraorally, and a rubber-dam drain was inserted through the external incision in the region of the angle. A heavy gauze pad was now placed over the wound and the patient returned to her room.

Postoperative.—There was a slight amount of bleeding immediately after operation. Elevation of the head together with the administration of 2 c.c. of hemoplastic serum controlled what hemorrhage existed.

A Murphy drip was inserted and saline was administered for twenty-four hours.

Fig. 5.—In this picture it is seen that the masseter has been severed and the hypoglossal nerve (*B*) has come into view after removal of the submaxillary gland, although in our case report the submaxillary gland was not disturbed. The mental artery has been severed, and tied. The anterior belly of the digastric and the sternomastoid are seen at the lower border of the opening. (From Silverman, *Principles and Practice of Oral Surgery,* P. Blakiston's Son & Co., Inc.)

An order for morphine as needed to control pain was left on the chart, but it was not used as the patient had no pain.

The temperature rose to 101° on the afternoon of the day of operation but gradually leveled off to normal on the seventh day and there it remained.

Oral cleanliness was maintained by the use of hot, normal saline washes, t.i.d., and hydrogen-peroxide and gauze swabs about the teeth.

The iodoform gauze packing was removed at the end of a week and the wound irrigated with 1-5000 potassium permanganate and normal saline, daily, for seven days. Irrigations were then discontinued because of the difficulty of

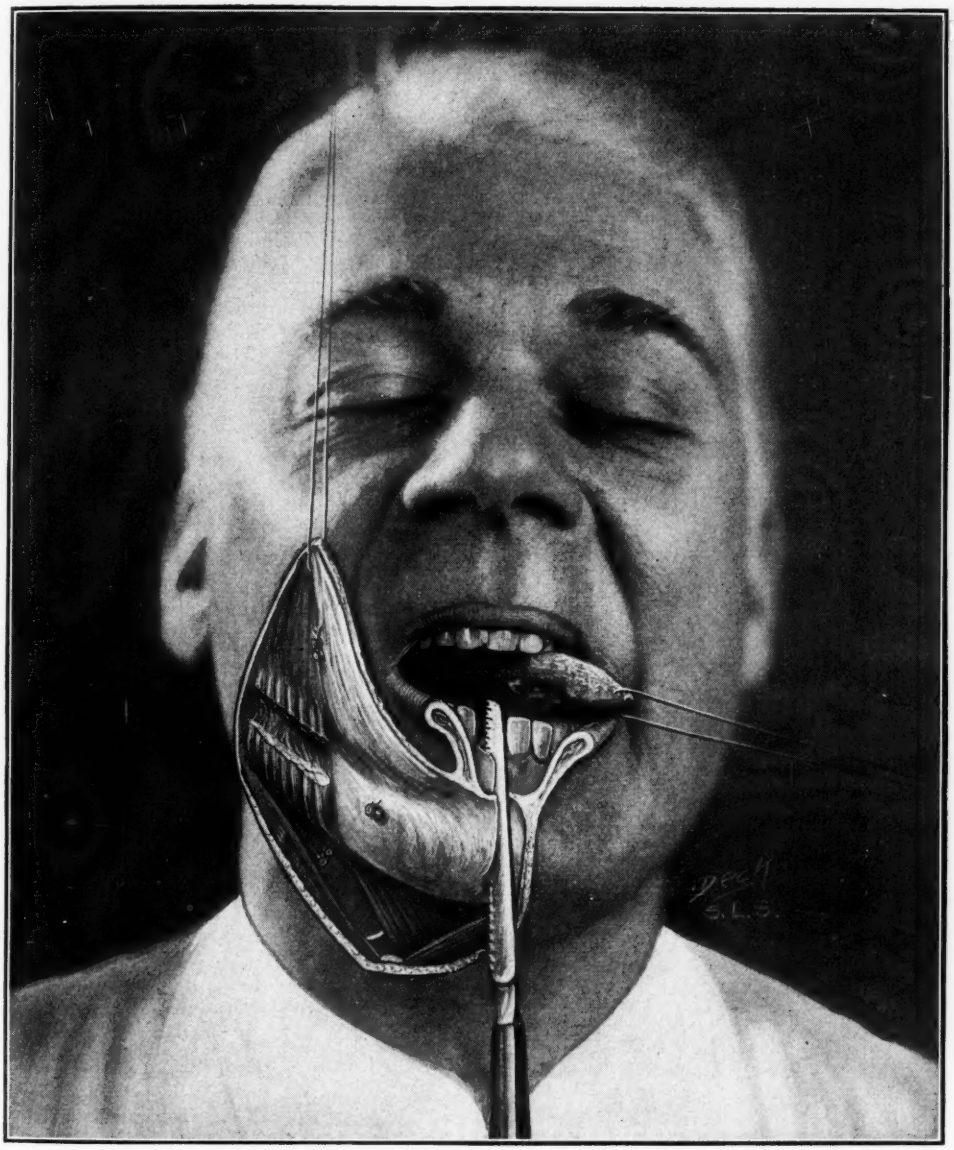


Fig. 6.—Showing the point at which the bone is sawed in two after the extraction of the tooth. (As stated in the report, the bone was separated with a Gigli saw and not by means of one of the type illustrated.) (From Silverman, *Principles and Practice of Oral Surgery*, P. Blakiston's Son & Co., Inc.)

syringe insertion due to granulation. Some serous discharge continued for several more days and then stopped. The reason for leaving the iodoform gauze in the opening for a week was to insure its freedom from adhesion to the tissue, thus preventing production of hemorrhage upon withdrawal.

The diet consisted of regular fluids through a feeding tube, and the

patient was able to take nourishment from the first. There was no marked loss of weight.

Pathologic Laboratory Report.—Specimen consists of the right mandible (Figs. 8 and 9) beginning with the premolars in front and extending back to and including the coronoid and condyloid processes and a little attached muscle

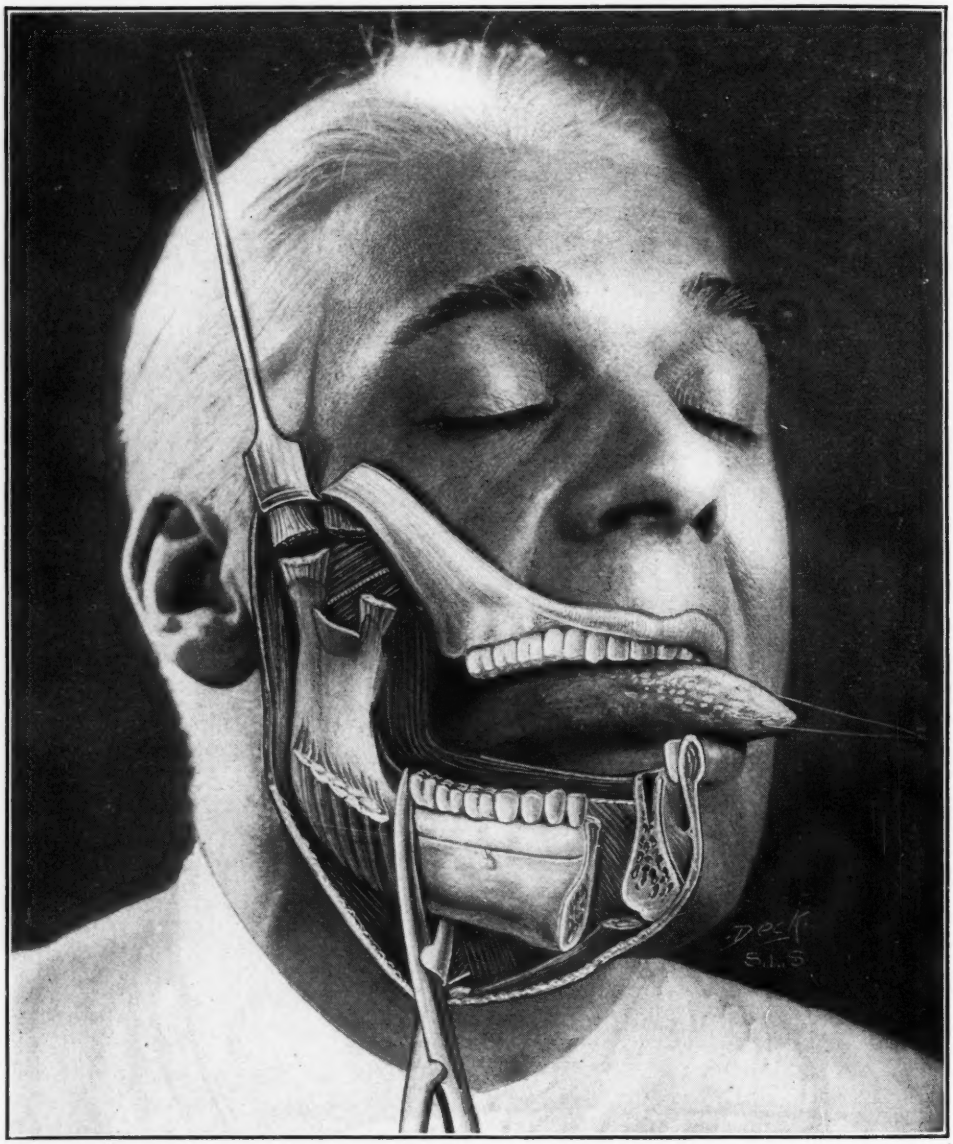


Fig. 7.—The internal maxillary artery can be seen on the surface of the external pterygoid muscle. The temporal muscle is seen to have been cut. The jaw has been grasped preliminary to lateral depression for exposure of the internal pterygoid muscle which will be severed. After this the mandibular artery is cut and ligated, the condyle disarticulated and the jaw removed. (From Silverman, *Principles and Practice of Oral Surgery*, P. Blakiston's Son & Co., Inc.)

tissue. There are three teeth present. Between the last molar and the coronoid process, and chiefly on the inner aspect, there is a rather firm fibrous mass, a portion of it being almost cartilagenous in appearance. Just in front of this mass there is a cyst cavity about 1 cm. in diameter and a slightly smaller one

just before the condyloid process begins. There is a large cystic mass on the lower angle, measuring 4 cm. by 2 cm. It is multilocular, dark in color, and, when pressed upon, has somewhat the feeling of a moderately hard tennis ball. There is a similar although much smaller cyst just anterior to it. There is also a large cyst on the lateral surface, about the same size as the first one described. There is a small cyst, 7 mm. in surface diameter, 5 mm. from the tip of the condyloid process on the lateral side (Figs. 8 and 11).

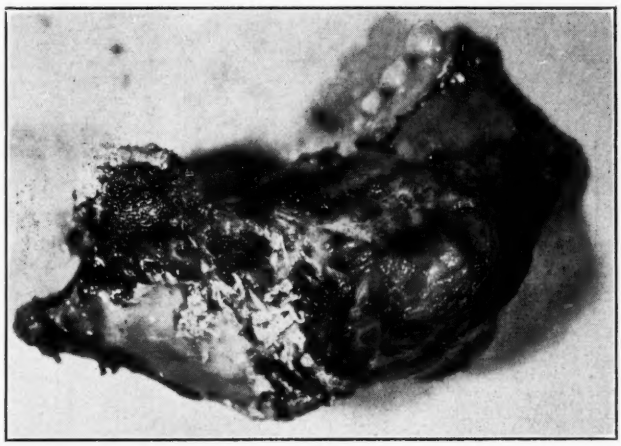


Fig. 8.—Lateral view of the resected mandible. The cystic elevation is quite apparent as are the erstwhile attachments of the masseter and temporal muscles. Note the cyst on the neck of the condyle which did not appear, of course, in the original x-ray picture.

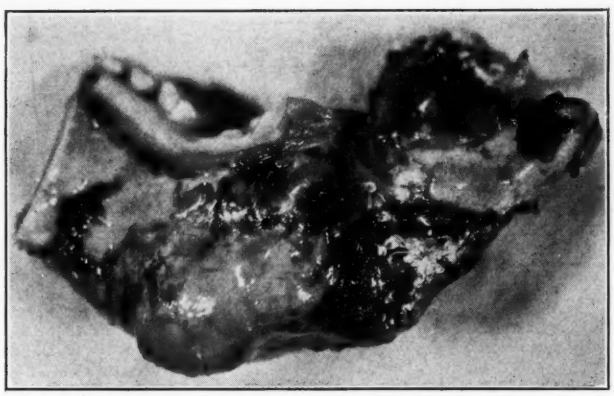


Fig. 9.—Medial view of the resected mandible. The extensive medial cystic elevation is quite evident, as are the points of attachment of the internal and external pterygoid muscles. Something of the nature of the intraoral appearance can be gleaned from that portion of the picture just distal to the molar tooth.

The jaw was sawed in two (Fig. 10), beginning with the last tooth and extending backward through the condyloid process, dividing the latter in half. There were a number of large cyst cavities divided, the largest measuring 2.25 cm., and they were filled with a dark, jellylike material. There were ten fairly large cysts and a number of tiny ones, and these were spread well over the entire cut surface of the jaw. About 3 cm. anterior to the tip of the condyloid process there is an impacted molar, one root having been divided and another one being visible in the above-mentioned cyst cavity. The bone surrounding

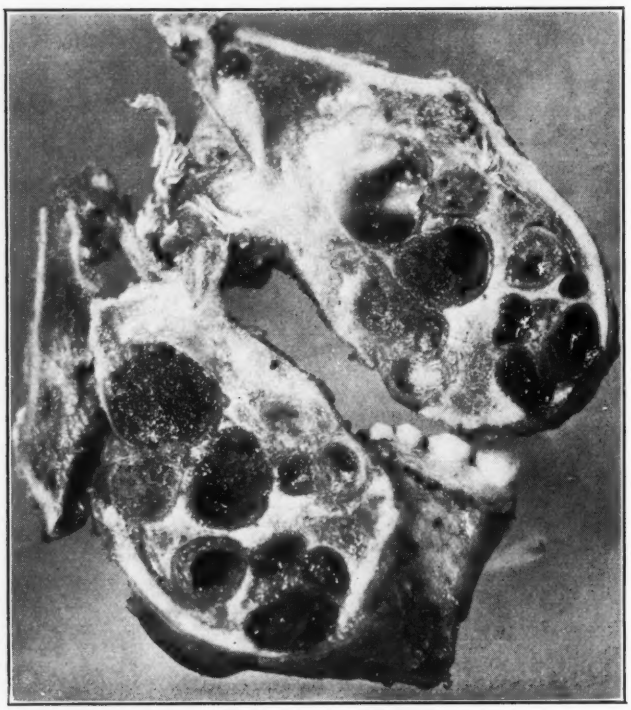


Fig. 10.—Cut section of the specimen. The cysts, walls and nature of the contents can easily be seen. In the upper half can be seen the divided third molar and at the neck of the condyle is the small cyst which was missed in the original x-ray picture.

Fig. 11.—Roentgenogram of the specimen. The condylar cyst is again evident and also a small beginning one just about 1 cm. anterior and superior to it.

these cysts is fairly firm, except for the mass of soft tissue in the superior angle, mentioned before.

Microscopic sections reveal areas in which there are fairly solid alveolar-like collections of cells. The periphery of these masses is lined with a rather high cylindrical type of epithelial cell, while toward the center they have a rather stellate shape. There is also beginning central degeneration, in fact

Fig. 12.—Photomicrograph of a cut section of the growth. (See laboratory report for the description.)

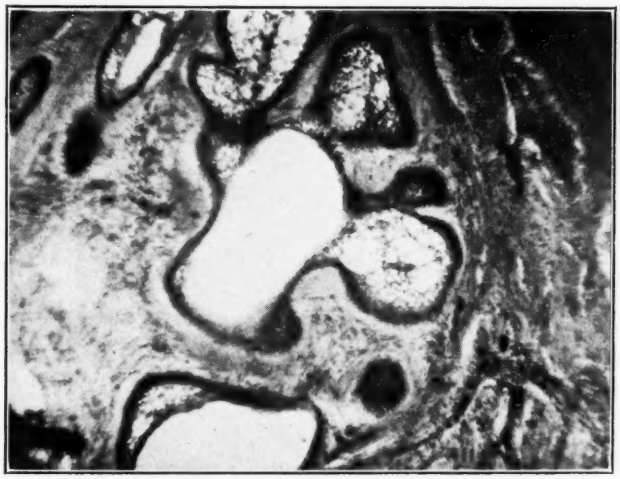


Fig. 13.—Photomicrograph of a cut section of the growth. (See laboratory report for the description.)

in Fig. 12 there are a number of small cyst cavities in the large clump to the right, and a fairly large cyst at the lower border. In the second photomicrograph (Fig. 13) there is a large cyst in the center, and connected with it are three fairly large collections of cells surrounded on the outside by the characteristic cylindrical cells, and the balance being almost entirely degenerated.

Diagnosis: Adamantinoma polycysticum or epithelioma adamantinum cysticum.

Fig. 14.—Anterior view of the patient twelve days after operation. The line of incision can still be seen, of course. There is some swelling remaining on the operated side (right), but this has since gone down, leaving a very slight flattening.

Fig. 15.—Lateral view of the patient twelve days after operation. The line of incision can plainly be seen. The dark, messy appearance along this line is due to some mercurochrome which was not washed off. Under the lobe of the ear can be seen one of our points where we inserted the syringe for irrigations. The majority of the scar will be under the chin and out of sight but of course cannot be entirely obscured.

COMMENTS

The adamantinomas arise from epithelial rests or paradental débris. Certain cells of the enamel organ (such cells being remnants of the primary epithelial cord) develop erratically, forming later, by their development, these tumors or newgrowths.[1] This accounts for the presence of an epithelial type of neoplasm in the medullary part of the bone.

These tumors are of a malignant nature, increasing in size sometimes more rapidly than others. They occasionally endure for many years with only a slow growth, and they never metastasize through the lymph system. If the neoplasm is removed entirely, there is no local recurrence, but incomplete operation merely means more operations to come.

Bloodgood[2] states that, "In late cases where the entire jaw is involved . . . the operation must be complete dissection. But, in the earlier cases . . . the malignant tissue can be completely removed with the cautery and the continuity preserved so there is no loss of function or mutilation." The early cases he refers to are monocystic, although on occasions they are quite large.

It is quite evident from the experience in this case (Figs. 8, 10, and 11) that if one is to make a complete diagnosis of the extent of the tumor it is necessary to have roentgenograms of the whole mandible, including the condyles.

All of the reported cases of adamantinomas which I reviewed contained unerupted, impacted third molars. It is entirely possible, of course, that these teeth are in their buried positions because of the neoplasms, but one cannot help but wonder if there is any etiologic connection.

The intermaxillary wires should be left on for at least a month after the wound is apparently healed.

The operation for complete resection of one-half of the mandible is not as deforming as one should suppose (Figs. 14 and 15).

I wish to express my gratitude to Dr. Oliver W. Lohr, Director of the Saginaw Laboratory of National Pathologic Laboratories, Inc., for his pathologic report and photography, and to Dr. Clarence Toshach for his assistance in operation and treatment, as well as to Dr. L. P. Chappelle, who originally referred the patient.

REFERENCES

1. Seudder: Tumors of the Jaws, Philadelphia and London, 1912, W. B. Saunders Company.
2. Bloodgood: In Lewis' Practice of Surgery, Hagerstown, 1930, W. F. Prior Company, Inc.

ABSTRACT OF
CURRENT LITERATURE

NUTRITION AND PEDIATRICS

By Samuel Adams Cohen, M.D., New York City

It is the purpose of this Journal to review so far as possible the most important literature as it appears in English and foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

The Environmental Background of Juvenile Delinquency. Leonhard Seif. Arch. Neurol. & Psychiat. **24**: 5, 1930.

Leonhard Seif of Munich, Germany, states that individual disorders are reflections of social disorders. He mentions the fact that the child normally begins life with an actual inferiority, and his normal process of growth is a striving to overcome the experience of inferiority and to rise to a point of superiority, and slowly with the aid of an environment which gives him encouragement, training, and love he makes real progress in these endeavors.

But, usually, the surroundings are far from perfect, and under their influence the child does not develop community feeling harmoniously but tends rather to self-defense to intensify his egotistic attitude.

Among those factors which retard his harmonizing or adjusting his egotistic feelings with the community feelings may be mentioned organic inferiority, such as defective eyes, heart, and the like, which may cause him to feel that he has not the same chance as other children have.

Being raised in a household where there is poverty, poor hygiene, domestic difficulties, and emotional tension between father and mother, is a distinct handicap to the upbringing of the child.

As other writers mentioned time and again, Seif emphasizes the fact that in the first three or four years of life the attitude of those around the child constitutes his education. "But," he says, "how poorly is the average parent prepared for this task!" At one extreme the child is spoiled by getting everything, and soon he wants and expects too much. At the opposite extreme is the selfish, loveless parent, steadily imposing (with moments of affection intervening) his or her will on the child, and acting in a tyrannical way. Such exaggerated attitudes are quickly felt and resented by the child, and this oppressive rule invariably raises a counter-pressure of some sort on the child's part, and the consequence is a vicious circle. This repressive education only intensifies the child's inferiority feeling.

Another common source of discouragement to the child is the talk about inheritance and "gifts." This gives the child a perfect "alibi" for reducing his work, or an excuse for his "bad streak," or, for instance, for his poor work in drawing in school.

According to Seif, both neurosis and delinquency are acquired, not inherited, and no child is born with an obligation to either. The child reflects the fault of the educators; and all parents, school-teachers, physicians and others who are responsible for his upbringing should rouse the lost confidence of the child in himself first by becoming trustworthy to him, and second by showing him friendly benevolence, and finally by treating him as an equal.

Diabetes Mellitus—Is Climate a Responsible Factor in the Etiology? C. A. Mills. Arch. Int. Med. **46**: 4, 1930.

In a study of the incidence and death rate of diabetes throughout the world, Mills presents some very interesting data. In the United States, the southern states have the lowest diabetic death rate, the western plateau and the mountain states coming next, with the northern states from Michigan west, and the middle states from the Atlantic Ocean to the Pacific Ocean following in their frequency, and finally the northeastern states, with a rate of 2.2 times as high as that of the southern group. In order to determine whether or not the low diabetic rate in southern states was due to their large proportion of colored population, this investigator noted that diabetes is almost as prevalent in the negro as in the white race, and that the rate increases with about equal rapidity in both races as one goes from south to north.

In Canada the diabetic death rate as a whole is considerably below that of the United States, and the greatest incidence of diabetes in Canada is in those provinces nearest to the New England states, where the death rate from diabetes in the United States is the highest.

In Europe with its great diversity of people and no outstanding dietary factors, one finds a division along the fiftieth parallel, with a comparatively high diabetic death rate north, and a low death rate south. For instance, during the year 1927 countries situated in the north of Europe, such as the Netherlands with 1.59 deaths from diabetes as percentage of the total number of deaths; Denmark with 1.12, England and Wales with 1.02, show a much higher diabetic death rate than Spain with 0.45, or for instance Hungary with 0.24.

The same climate distribution of the disease is seen also in Australia, Tasmania, and New Zealand, where the rate increases as the distance from the equator becomes greater. The same observation holds true for Africa and the countries of South America.

With regard to Asia, the author notes that in Japan and North China diabetes is comparatively scarce and mild, and these countries supply an exception to the climatic distribution of this disease, but Mills attributes the low rate to the moist, tropical weather.

Summarizing, Mills states that the regions possessing the most changeable and stimulating climate are the ones with the highest incidence of diabetes.

Diabetes Mellitus—Sugar Consumption in Its Etiology. C. A. Mills. Arch. Int. Med. **46**: 4, 1930.

In his studies of the death rate of diabetes and consumption of sugar in kilograms per capita throughout the world, Mills does not find any uniformity between the intake of sugar and the deaths from diabetes. In some countries which have a high consumption of sugar rate, as Hawaii, Argentina, Cuba, there is a relatively low death rate from diabetes.

In the United States the consumption of sugar has been fairly constant for several years, but diabetes continues at an alarming increase.

These observations and further data are cited by Mills to indicate "that consumption of sugar as such is not related in a causal way to the death rate from diabetes."

The Clinical Aspect of Disturbances of the Parathyroid Gland. J. C. Meakins. Brit. M. J. 3646, 1930.

J. C. Meakins, director of the Department of Medicine, McGill University, states that the function of the parathyroid gland is the maintenance of the calcium content of the blood plasma at a definite level, and the control of the calcium balance of the body. Moreover, these glands have an important function in regulating calcium metabolism of the fixed tissues, particularly the osseous tissue.

The term "parathyroid tetany" is a condition which occurs subsequent to the removal or injury or degeneration of the parathyroid glands, and is characterized by increased mechanical or electrical excitability of the neuromuscular system, and muscular hypertonicity, leading to painful spasmodic contractions of the muscles of the limbs, trunk, larynx, diaphragm, bladder and bowel. The calcium content of the blood is decreased. The term "tetany," on the other hand, does not imply that the pathologic condition is due primarily to a deficiency of parathyroid function; clinically, it is a syndrome which may occur with any condition where there is low blood calcium, or even a normal blood calcium with a prolonged negative balance.

When there is a condition of hyperparathyroidism, such as occurs with parathyroid tumors, the clinical picture usually presents generalized osteitis fibrosa, high serum calcium, a tendency to hypertonicity and hypoexcitability of the neuromuscular system, a pronounced rarefaction of the bones with fractures and sometimes bone cyst formations; and a resorption of the corticales and original spongiosa. This picture presents a striking contradistinction to that showing a cessation of calcification which is characteristic of osteomalacia and rickets.

Edemas in Infancy. Jean Cathala. Nourrisson **18**: 2, 1930.

The author points out that the water content of the human being diminishes from the time of conception, thus the water content of the body of a

six weeks' embryo is 97.5 per cent, 73.7 per cent of the fetus at term, 69 per cent of the newborn, and from 63 to 58 per cent of the adult body is composed of water.

Cathala further points out the fact that the relative need of water during infancy is much higher than that later on in life. In addition he feels that the physiology and pathology of water intake and output should receive more attention and study.

Edemas are caused by congenital anomalies of the heart and the urogenital tract. This French author mentions the fact that generalized edema may be due to congenital syphilis of the liver. Congenital debility and prematurity are a few of the other causes of edema which are mentioned.

He further classifies the etiology of edema under four headings:

(1) Disturbances in the state of nutrition;
(2) Constitutional states;
(3) Alimentary edema;
(4) Edema due to infections.

The Nervous Child—Diagnosis and Treatment. Carl Pototsky. Deutsche Med. Wchnschr. **56**: 33, 1930.

Writing from the outpatient department of Empress Hospital near Berlin, the author reports on some of his experiences with nervous and "difficult to manage" children. He believes that the physician is too prone to treat one symptom, for example, enuresis, rather than the symptom complex of nervousness in the child. This expert points out that the examination of the child should also include the attitude of the child's guardian or parent, and this observation can easily be made while they are in the doctor's waiting room. The child's reaction to the surroundings should also be noted, for example, by observing his expression and conduct. The patient should also be examined from the standpoint of the neurologist and of the pediatrician. The examiner should ask himself these questions: (1) does the child appear normal? and (2) in what direction and how extensive is the departure from the normal zone?

Pototsky has made some very interesting studies of these children by means of the capillary microscope. The neuropathic (vasoneurotic) children were found to have twisted capillaries, and some children with endocrine disturbances were discovered to have underdeveloped, hypoplastic blood vessels. From the practical point of view, the author is of the opinion that the most satisfactory psychologic examination of the child is to observe his response to the performance of his routine daily tasks.

Pneumococcus Type I Pneumonia. Russell L. Cecil and Norman Plummer. J. A. M. A. **95**: 21, 1930.

Cecil and Plummer report some of their results in their intensive bacteriologic study of 3662 cases of lobar pneumonia in adults observed by them during the past ten years at the Bellevue Hospital, New York. Of these 30.9 per cent were pneumococcus type I infections; type II were next in frequency

with an incidence of 23.24 per cent; type III caused only 11.9 per cent, and the miscellaneous group of pneumococci was responsible for 34.1 per cent of the pneumonias studied in this series. On the other hand in a bacteriologic study of lobar pneumonia in 147 cases observed in children at the same hospital, Plummer and his coworkers found only 9.5 per cent of these were pneumococcus type I.

During the past year blood cultures were carried out as a routine procedure in lobar pneumonia, and 29.7 per cent of 64 cases examined showed a positive blood culture. These figures are in accord with other investigators.

During the period from 1920 to 1929 in pneumonia type I cases not treated with serum, the authors' mortality rate was 28 per cent.

During the years 1924 to 1929, 239 cases of type I pneumonia were treated with Felton's concentrated serum with a mortality of 20.1 per cent, which compares favorably with a 31.2 per cent mortality on alternate cases which were used as controls.

A more striking reduction is noted in the serum treatment of cases of pneumonia type I pneumococcus as compared with the control in cases of pneumonia admitted seventy-two hours after onset of the disease. The figures indicate that the 26.8 per cent mortality of untreated serum cases as being two and one-half times as high as the group treated with Felton's concentrated serum. However, for statistical purposes because of the unfavorable type of patient (alcoholics and the like) admitted to Bellevue Hospital, the mortality rates in all their cases of pneumonia are higher than those of other investigators. The death rate of the authors' series of those patients showing a type I pneumococcus bacteremia was 66.7 per cent, which was three times as high as the cases which did not have a positive blood culture.

In regard to children under twelve years of age, their mortality for lobar pneumonia type I pneumococcus was only 3.3. In 30 cases of type I pneumonia in children, empyema was noted in 5, or 16.7 per cent of the cases.

In their summary and conclusion the writers are in accord with most of the investigators on this important subject. They emphasize the fact that type I serum has passed the experimental stage for treatment in type I pneumonia. Furthermore, they strongly advocate the use of the concentrated serum because it possesses all the therapeutic value of unconcentrated serum, with the advantage that it is more easily administered and less frequently followed by chills, serum reaction and serum sickness.

The International Journal of Orthodontia, Oral Surgery and Radiography

PUBLISHED THE FIFTEENTH OF EVERY MONTH BY

THE C. V. MOSBY CO., 3523-25 Pine Blvd., St. Louis, Mo.

Foreign Depots — *Great Britain* — Henry Kimpton, 263 High Holborn, London, W. C.; *Australasia*—Stirling & Co., 317 Collins Street, Modern Chambers, Melbourne; *India*—"Practical Medicine," Egerton Street, Delhi; *Porto Rico*—Pedro C. Timothee, Rafael Cordero 68, San Juan, P. R.

Subscription Rates—Single copies, 75 cents. To anywhere in United States, Cuba, Porto Rico, Canal Zone, Mexico, Hawaii and Philippine Islands, $7.00 per year in advance. Under foreign postage, $7.40. Volume begins with January and ends with December of each year.

Remittances—Remittances for subscriptions should be made by check, draft, postoffice or express money order, or registered letter payable to the publishers, The C. V. Mosby Company.

Contributions—The editor will be pleased to consider the publication of original communications of merit on orthodontic and allied subjects, which must be contributed solely to this Journal.

Opinions—Neither the editor nor the publisher hold themselves responsible for the opinions of contributors, nor are they responsible for other than editorial statements.

Reprints—The publishers will communicate with authors regarding reprints upon publication of paper.

Communications—Contributed articles, illustrations, letter, books for review, and all other matter pertaining to the editorial department should be addressed to the Editor, Doctor Martin Dewey, 17 Park Ave., New York City. All communications in regard to advertising, subscriptions, change of address, etc., should be addressed to the publishers, The C. V. Mosby Company, 3523-25 Pine Blvd., St. Louis, Mo.

Illustrations—Such half-tones and zinc etchings as in the judgment of the editor are necessary to illustrate articles will be furnished when photographs or drawings are supplied by the authors of said articles.

Advertisements — Objectionable advertisements will not be accepted for publication in this Journal. Forms close first of month preceding date of issue. Advertising rates and sizes on application.

Change of Address—The publishers should be advised of change of subscriber's address about fifteen days before date of issue with both new and old addresses given.

Nonreceipt of Copies—Complaints for nonreceipts of copies or requests for extra numbers must be received on or before the fifteenth of the month of publication; otherwise the supply is apt to be exhausted.

Entered at the Post Office at St. Louis, Mo., as Second-Class Matter.

EDITORIAL

Information Concerning Examinations by the American Board of Orthodontia

THE American Board of Orthodontia at the recent meeting in Denver, prepared a booklet concerning the origin, aims, and procedure of the Board. All those who are interested in securing copies of this booklet can do so by writing Dr. Oren A. Oliver, Secretary of the Board, 1101 Medical Arts Building, Nashville, Tenn.

The majority of practitioners are particularly concerned with the course pursued in the examination of candidates. As a result, we are taking the following from the booklet because we believe it is of general interest to the orthodontic profession:

"Applicants for examination for the certificate of the Board are nominally divided into three classes, according to the length of time they have practiced Orthodontia:

"Class I. Those who have practiced Orthodontia exclusively fifteen years or more.

"Class II. Those who have practiced Orthodontia exclusively seven years, but less than fifteen years.

"Class III. Those who have practiced Orthodontia exclusively less than seven years, but at least five years, or an equivalent to be determined by the Board and based upon the following conditions:

"First, an instructor in Orthodontia in a school satisfactory to the Board.

"Second, an associate in the office of an orthodontist whose standing is satisfactory to the Board.

"It is, however, to be definitely understood that any person at the time of making application for a certificate shall be in the exclusive practice of Orthodontia in his own name.

"The action of the Board will not necessarily be governed by the foregoing classification. It is conceivable that a man may have practiced Orthodontia for fifteen years or longer and still might be asked to demonstrate his ability to the satisfaction of the Board.

"The following requirements are demanded by the Board for members of all three classes:

"1. High ethical and dental standing in their communities, and also a dental degree satisfactory to the Board.

"2. Formal application on an official form with letters of endorsement by two well-known orthodontists.

"3. Case histories may also be required; however, this requirement is left to the judgment of the Board.

"The special requirements for each of the three classes are as follows:

"Class I. The Board will determine from the applicant's training, published records, and professional work in his community, whether examination will be necessary before conferring its certificate. Case histories may also be required if, in the judgment of the Board, they are desirable.

"Class II. Report of ten cases that have been treated by the applicant and observed through the postoperative period until a sufficient length of time has elapsed to determine the success of treatment. Also examination in certain subjects as the Board may require.

"Class III. A degree from a dental school of high standing, satisfactory to the Board. Applicants, however, in this class will be expected to take the examination as required by the Board.

"The preparation of one or more theses of at least twenty-five hundred words each may be required of applicants under any classification, the subject of such theses to be assigned by the Board."

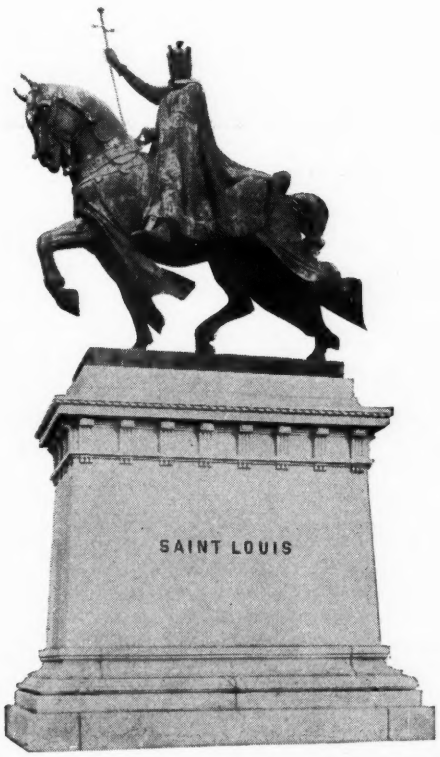
NEWS AND NOTES

The American Society of Orthodontists

Thirtieth Annual Meeting

St. Louis Expects You

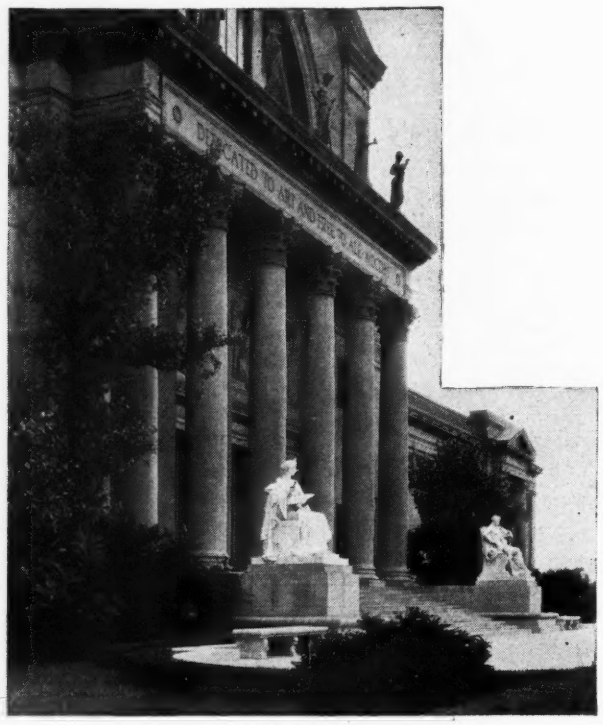
Only a few short weeks until the big event—we are expecting you. We have tried to tell you something about St. Louis in the two articles that preceded this one. Of course we could not tell you everything about St. Louis as that would take volumes. But we hope you have heard enough about it to realize that you simply must visit St. Louis during the week of April 21-24.



Statue of St. Louis on Art Hill in Forest Park.

There is still more we want you to know about our city, such as the St. Louis Art Museum which was erected during the World's Fair as a permanent building. Ranked as one of the four best art galleries in the United States, the Museum contains rich exhibits of paintings, casts, sculpture, marbles, drawings, architecture and applied arts. Many rare canvases are here, exemplifying the famous work of the old masters. The collection of Chinese bronzes, ceramics and paintings is one of the finest of its kind.

Standing on the crest of Art Hill, the Museum overlooks the west-end residential district and the suburbs which stretch out to the north and west. Its immediate foreground opens



Art Museum in Forest Park.

Pavilion on Sunset Hill in Forest Park.

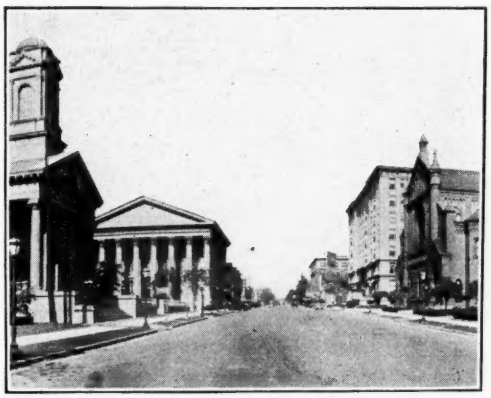
up a vista of sloping landscaped lawn, of glimmering lakes, of speeding motor cars on the winding drives below, and, in the distance, the city's edge. At night powerful flood lights

play on the building which can be seen from great distances. No other museum in America has such a setting of natural splendor. This great treasure house of art is open daily to all.

Art Hill, whose crest commands a natural amphitheater, the council grounds of Indian nations in centuries past, has been the scene in recent years of great communal gatherings. On this broad hillside there one day gathered 300,000 citizens at an inspirational meeting for the Third Liberty Loan. Again in 1914, this same Art Hill, the cradle of St. Louis progress, formed an outdoor theater for the Pageant and Masque of St. Louis. It was here on Art Hill that thousands of people gathered one day to welcome Col. Charles A. Lindbergh back home after his thrilling flight across the Atlantic.

On Art Hill stands the heroic statue of St. Louis by Niehaus, at the base of which was enacted the most impressive ceremony modern St. Louis has witnessed, when the French Legion on its visit here, dipped colors for the second time in history, honoring St. Louis as no other city in the world has been honored.

In keeping with the city's natural trend of diversified development is its wide and influential field of churches and church leaders. Its famous churches and its clergy made up of well-known figures of national prominence have through years strongly influenced the spiritual nature of St. Louis and built up within it a normal tone equaled by few metropolitan communities. There are located in St. Louis City and County 100 Catholic churches and



Group of Churches on Kingshighway Boulevard.

530 Protestant churches, with a communicant membership of several hundred thousand, four Christian colleges and four theological seminaries. St. Louis is the international headquarters of three denominations and the state or regional headquarters of nine.

Among the salient features of the city's religious side is the Metropolitan Church Federation. Organized in 1909, it has since cooperated the church work of sixteen denominations under jointly authorized leadership and carried on united moral work impossible for a single church or denomination working alone.

One of the finest groups of representative architecture in the city is at Kingshighway and Washington Boulevards, where the four corners are occupied by magnificent churches—Temple Israel, First Church of Christ Scientist, St. John's Methodist Episcopal, South, and the Second Baptist. The latter is one of the finest examples of Italian Gothic architecture in America. Organized in 1832, it is the oldest Baptist church within the city limits.

The New Cathedral is the seat of the Catholic Church in the St. Louis Archdiocese. It is one of the largest and most magnificently furnished cathedrals in this country and compares favorably with the finest ecclesiastical structures of Europe. It was erected at a cost of three and a quarter million dollars. Its main altar represented an expenditure of $100,000 and its organ $50,000. The Old Cathedral occupies the site of the first church built in St. Louis, shortly after the landing of Laclede in 1764, Pope Gregory conferred favors on this Old Cathedral granted to no other church in the world except the Basilicas in Rome.

Christ Church Cathedral, mother church of the Episcopal Diocese of Missouri, is the first Protestant church founded west of the Mississippi River. Its stone altar, imported from

Washington University School of Medicine.

Italy, is a masterpiece of beautiful carving. A new great organ has recently been installed, and a diocesan, parish and community building has recently been erected to the memory of Daniel Sylvester Tuttle, pioneer bishop of the Episcopal Church.

National recognition has been accorded many of the eminent divines among the St. Louis clergy. Approximately thirty of the city's priests, ministers and rabbis are cited in "Who's Who in America" for their distinguished work.

St. Louis has two widely known and well equipped institutions of higher education, Washington University and St. Louis University. Washington University has had a phenomenal growth. Not only local capital but some of the great Eastern foundations have given substantial backing to this institution. It has fourteen major schools and divisions, including the well known Mary Institute, a school for girls.

St. Louis University was established by the Catholic Bishop as the first university in the West, when St. Louis had a population of less than 3,000.

Both of these universities have medical and dental schools which are among the leading schools in the country. The Washington University School of Medicine is operated in connection with Barnes Hospital, and constitutes one of the most extensive medical institutions in America.

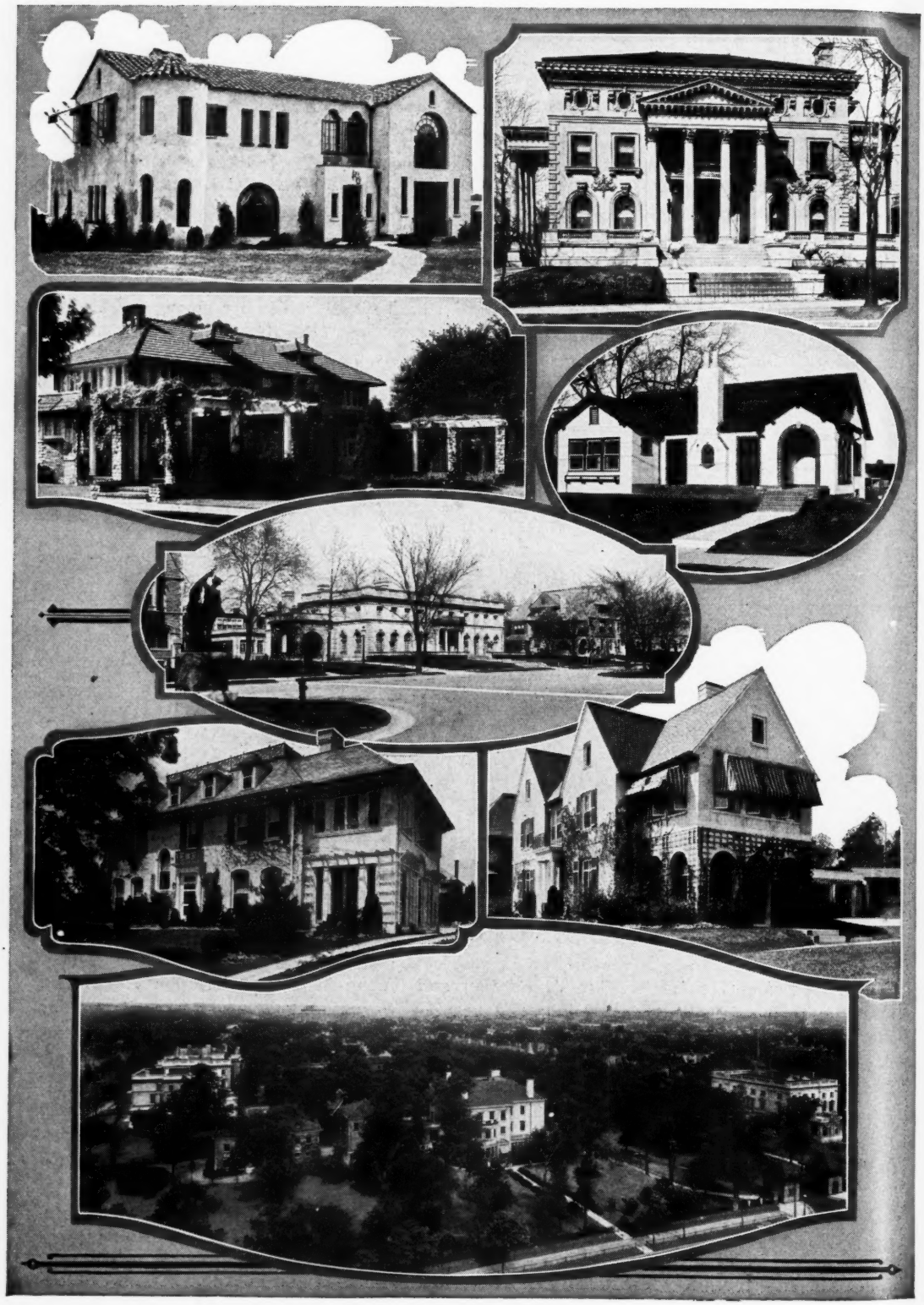
St. Louis University.

The Young Men's Christian Association and Young Women's Christian Association maintain commodious central buildings and branches in various sections of the city. They are modernly equipped with gymnasiums, swimming pools, roof gardens, libraries, baths, bowling alleys, reading rooms, cafeterias and other facilities for the benefit of young men and women.

An extensive Y. M. C. A. development is assured by a fund of $3,000,000 recently raised by popular subscription in St. Louis to erect "Y" buildings in the downtown district, West End, South Side and Carondelet, and to make additions to the North Side, Colored and Railway Branches.

The Young Men's Hebrew Association and Young Women's Hebrew Association together occupy a new half-million-dollar model structure. Here are all the facilities of modern institutions of this type, including roof garden, gymnasium, swimming pool, auditorium, billiard room, clubrooms and classrooms. Its membership of 4,000 which was obtained without a campaign includes people of all faiths and ages.

St. Louis Council, Boy Scouts of America, is one of the most important organizations of its kind. It ranks first in the United States in Scouting membership per ten thousand



St. Louis Residential Districts.

population and in troop density. It possesses the best equipped Boy Scout camp in the United States. Its program of activity constantly attracts national attention.

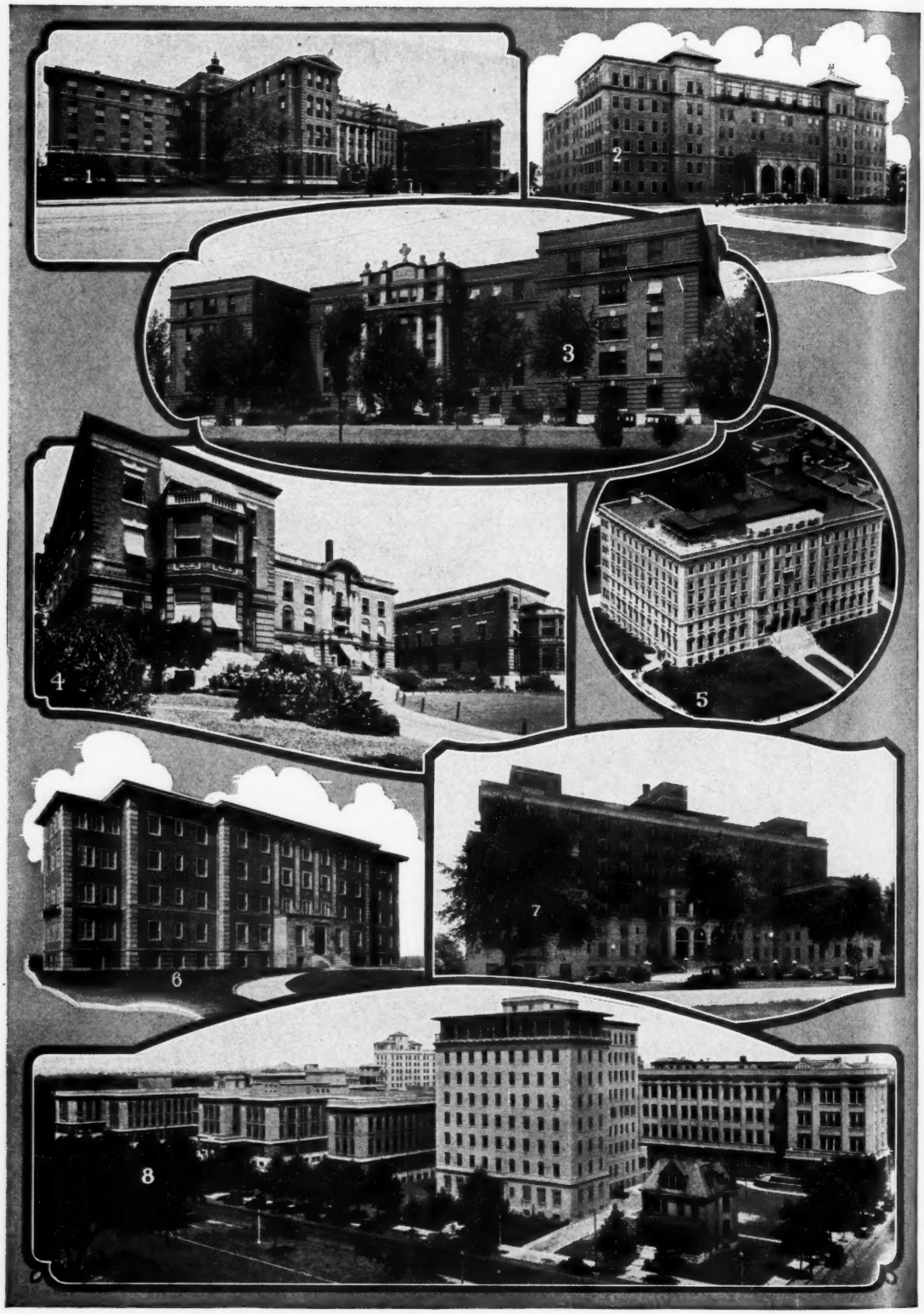
The organization of Girl Scouts, which has no connection with the Boy Scout movement, is also very active in St. Louis and has a splendid membership enrollment.

The remarkable record of public health in St. Louis and the efficiency of its health commissioner are outstanding among cities of this country. Due to climatic advantages, scientific supervision of water, milk and food, and waste and sewage disposal, and to its advanced sanitary and medical cooperative methods, St. Louis ranks in the honor roll of healthful communities. Its general death rate is among the lowest in large cities.

Olive Street in the Business District.

Still more significant is the fact that St. Louis is the lowest of all large cities in its infant mortality rate, the factor considered most important in gauging the general health of any community. A former health official of another city recently stated in a published article: "I know of no greater advertisement for a city than a low infant mortality. I am amazed at the remarkable results you have accomplished in a city the size of St. Louis. Yours is a wonderful city to be born in, and still more wonderful to grow old in."

There are ten Municipal Health Centers in St. Louis, operated under the direction of the Division of Health of the Department of Public Welfare. At these centers the follow-



1. City Hospital.
2. St. Mary's Hospital.
3. St. John's Hospital.
4. St. Luke's Hospital.
5. Missouri Pacific Hospital.
6. Christian Hospital.
7. New Jewish Hospital.
8. Barnes Group of Washington University Affiliated Hospitals.

ing clinics are held weekly: twenty-two "well baby" clinics, or conferences; 21 chest or tuberculosis clinics; 7 prenatal clinics; 20 clinics for the administration of such prophylaxis as antitoxin for protection against diphtheria, vaccination against smallpox and vaccination against typhoid fever. There are, in addition, 60 free dental clinics for indigent children.

These clinics are staffed by a very high type of physician and specially trained nurses. The service embraces the clinics already mentioned, as well as follow-up work by the nurses in the homes of patients attending these clinics. The entire program is from the side of prevention and correction. The municipal nurses are also utilized in following up communicable disease cases.

The people of St. Louis are unusually well protected in regard to public health. Approximately 97 per cent of all milk sold in the city is pasteurized. Even more stringent regulations than in the past regarding the examination of milk sources and the marketing of milk and milk products have recently been enacted. Measures for the protection of all food offered for sale are well enforced. Water supplies and sanitary methods for the disposal of wastes are safeguarded according to the best practices. Every possible precaution is taken for the public good.

In consequence, St. Louis has been remarkably free from epidemics. Its records show low typhoid death rates and low communicable disease rates. The advanced public health activities in this city and the thoroughness with which possible sources of disease have been eliminated have resulted in an exceptionally healthful community—one of the greatest of St. Louis' advantages.

There is so much of interest in the story of St. Louis, past and present, that it is impossible in an article of this kind to do more than touch on a few of its outstanding features. But St. Louis invites you. With sincere hospitality it urges you to come to see for yourself what this great metropolis of the middle-west is really like, to know its charm, and to revel in its beauties.

The American Society of Orthodontists

The annual meeting of the American Society of Orthodontists will be held in St. Louis April 21 to 24 at the Hotel Jefferson, Twelfth and Locust Streets.

When you are purchasing your railroad tickets be sure to get a certificate because a special return rate will be made if one hundred fifty certificates are obtained.

Make your reservations early at the New Jefferson Hotel, St. Louis, the headquarters for this meeting.

Entertainment for the ladies is being planned and will be announced in the final program later.

All local dentists who are members of the American Dental Association and physicians are invited to attend these sessions by securing a badge from the Secretary at the time of meeting.

GOLF TOURNAMENT

Monday, April 20, the annual golf tournament of the American Society of Orthodontists will be held at the North Hills Country Club. There will be a banquet for the golfers that evening at the club. Send your club handicap to the Golf Committee, Leo Shanley, F. C. Rodgers, 4482 Washington Boulevard, St. Louis, Mo. There will be prizes for all classes which are arranged according to handicap.

Final Program of the St. Louis Meeting

TUESDAY, APRIL 21, 1931

Morning Session

8:00 A.M. Registration.

9:00 A.M. Meeting called to order.

Address of Welcome—Chancellor G. R. Throop, Washington University, St. Louis, Mo.

Response—Oren A. Oliver, Nashville, Tenn.

9:30 A.M. President's Address. By Harry E. Kelsey, Baltimore, Md.

10:00 A.M. Business Session.

Report of Board of Censors. Paul G. Spencer, Chairman.

Report of Secretary-Treasurer—Claude R. Wood.

Report of Librarian—Abram Hoffman.

10:20 A.M. Original Research in Precious Metals Used in Orthodontia. By R. V. Williams, Metallurgist and Chemist, Buffalo, N. Y.

Discussed by Walter Ellis, Buffalo, N. Y.

11:15 A.M. A Report of Orthodontic Treatment of Deciduous Dentures. By Charles R. Baker, Evanston, Ill.

Discussed by F. A. Delabarre, Boston, Mass., and J. D. Eby, New York, N. Y.

12:15 P.M. Lunch.

Afternoon Session

1:15 P.M. The Relation of Malocclusion to Dental Pathology. By John A. Marshall, San Francisco, Calif.

Discussed by W. McKim Marriott, St. Louis, Mo., and Virgil Loeb, St. Louis, Mo.

3:15 P.M. The Result of Treatment of a Mesioclusion Case for an Adult Patient (Case Report). By Frederick E. Haberle, Chicago, Ill.

3:45 P.M. Treatment of Infra-occlusion of Anterior Teeth. By A. H. Ketcham, Denver, Colo.

Discussed by W. D. Flesher, Oklahoma City, Okla., A. W. Crosby, New Haven, Conn., and N. C. Leonard, Baltimore, Md.

7:00 P.M. Rehearsal of Clinics. Registration and assignment of space for all clinics.

7:30 to 9:30 P.M. Research Exhibit. By John A. Marshall, San Francisco, Calif. (This exhibit will be presented at this one time only.)

WEDNESDAY, APRIL 22, 1931

Morning Session

9:00 A.M. Business Session.

Report of Executive Committee on Nominations for American Board of Orthodontia.

9:15 A.M. Properties of Orthodontic Wrought Gold Alloys. By N. O. Taylor, U. S. Bureau of Standards, Washington, D. C.

Discussed by Max Kornfeld, St. Louis, Mo., and John Clauser, St. Louis, Mo.

10:15 A.M. The Maintenance of Facial Form After the Surgical Removal of Right Half of Mandible. Case Report. By George M. Anderson, Baltimore, Md.

10:45 A.M. The Dynamics of the New Angle Mechanism as Observed by a Non-Angle Man. By Ralph Waldron, Newark, N. J.

Discussed by E. Santley Butler, New York, N. Y., and F. B. Noyes, Chicago, Ill.

12:15 P.M. Lunch.

Afternoon Session

1:30 P.M. Evolutionary Factors Associated With Malocclusions. By Martin Dewey, New York, N. Y.

Discussed by Richard Summa, St. Louis, Mo., Oscar E. Busby, Dallas, Texas, and H. B. Robinson, Hutchinson, Kan.

2:45 P.M. The Treatment of a Unilateral Distoclusion, Complicated by Complete Linguoversion of Mandibular Teeth on Right Side. Case Report. By Fred Wolfsohn, San Francisco, Calif.

3:15 P.M. Four Sisters Having Congenitally Missing Teeth, and Orthodontic Treatment of the Same. Case Report. By A. B. Thompson, Des Moines, Iowa.

Business Session.

Report of Committees.

Report on President's Address.

Nomination of Officers.

Selection of next meeting place.

7:00 P.M. General Banquet. Toastmaster H. C. Pollock. Speakers: Clinton C. Howard, Atlanta, Ga., Edgar H. Keyes, St. Louis, Mo., and Clarence O. Simpson, St. Louis, Mo.

Dentition of Eskimos of North America. Illustrated with still and moving pictures. By L. M. Waugh, New York, N. Y.

THURSDAY, APRIL 23, 1931

Morning Session

9:00 A.M. Business Session.

9:15 A.M. Dentition in Cleft Palate Cases. By H. L. D. Kirkham, Houston, Texas.
Discussed by V. P. Blair, St. Louis, Mo., and M. N. Federspeil, Milwaukee, Wis.

10:30 A.M. Misplaced and Deeply Embedded Third Molars Necessitating Extraoral Removal. By M. N. Federspeil, Milwaukee, Wis.
Discussed by George B. Winters, St. Louis, Mo.

11:15 A.M. Deep Overbite. Case Report. By H. L. Parks, Atlanta, Ga.

Case With Congenitally Absent Mandibular Right First Premolar in Which the Maxillary Right First Premolar Was Extracted and the Spaces Closed Up. By E. B. Arnold, Houston, Texas.

12:15 P.M. Luncheon for Past Presidents, President, President Elect, and Secretary-Treasurers.

Afternoon Session

1:15 to 4 P.M. Progressive Clinics. General Chairman—J. D. McCoy, Los Angeles, Calif.

Orthodontic Diagnosis. By B. E. Lischer, San Francisco, Calif.

I. Case Histories and Examination Data. By Fred Wolfsohn, San Francisco, Calif., and Harvey A. Stryker, Santa Ana, Calif.

II. Photographic Facial Reproductions. By Earl Lussier, San Francisco, Calif., and Otto W. Brandhorst, St. Louis, Mo.

III. Plaster Denture Reproductions. By Allen Scott, San Francisco, Calif., and Joseph H. Williams, St. Louis, Mo.

IV. Radiographic Examinations and Interpretations. By Clarence O. Simpson, St. Louis, Mo., and Albert H. Ketcham, Denver, Colo.

V. Differential Diagnosis of Dentofacial Deformities. By Frank M. Taylor, Pomona, Calif., and George H. Herbert, St. Louis, Mo.

Orthodontic Treatment. Chairman—Joseph D. Eby, New York, N. Y.

I. Fixed Appliances. Labial Arches: Plain Round Arch (McCoy Tubes), High Labial Arch, Pin and Tube Arch, Ribbon Arch, Angle's Edgewise Arch. Lingual Arches.

II. Removable Appliances, Hawley Retainer.

III. Molar Band Technic.

IV. Media of Attachment for Anchor Teeth.

V. Media of Attachment for Anterior Teeth: Incisor Bands, Brackets or Tubes.

VI. Applied Therapy.

4:00 P.M. General Clinics.

No. 1. Practical Appliances for Open-Bite Cases. By Paul Lewis, Seattle, Wash.

No. 2. Ready-Made Base for Models. By Carlton B. Mott, Asheville, N. C.

No. 3. Various Uses of the Coil Spring. By E. B. Arnold, Houston, Texas.

No. 4. Treatment of Open-Bite Cases. By Ketcham and Humphrey, Denver, Colo.

No. 5. Submerged Deciduous Molars and Their Effect on the First Permanent Molars. By A. B. Thompson, Des Moines, Iowa.

No. 6. Some Ideas on Extraoral Anchorage. By W. E. Stoft, Omaha, Neb.

No. 7. A Specific Treatment for Unilateral Distoclusion. By Charles A. Spahn, Newark, N. J.

No. 8. The Treatment of a Very Unusual Fracture and the Results Obtained With the Aid of Orthodontic Appliances. By Guy M. Gillespie, Abilene, Texas.

No. 9. Precision Instruments for Properly Soldering Buccal Tubes, Half Round Tubes, Round Tubes, and Half Round Wire. Hard Point Pliers, Noncorrosive, Nonfusing, Nonoxidizing. Flame Intensifying Attachment for Grunberg Blowpipe, Adaptable to Natural and Artificial Gas. By Russel E. Irish, Pittsburgh, Pa.

No. 10. Appliance Construction and Soldering Technic, Illustrating Adapting and Bending Wire by Heat, and Methods Used in Soldering. By Ernest N. Bach, Toledo, Ohio.

No. 11. Cast Retention Plates With Roach Clasps. By Percy Norman Williams, Tucson, Arizona.

FRIDAY, APRIL 24, 1931

Morning Session

9:00 A.M. Business Session.

9:15 A.M. The Treatment of a Case of Malocclusion During Pregnancy. Case Report. By Ralph Howarth, Cleveland, Ohio.

9:45 A.M. A Résumé of Radiographic Service in Orthodontics. By C. O. Simpson, St. Louis, Mo.

Discussed by Sidney Reisner, New York, N. Y., and A. B. Brusse, Denver, Colo.

10:45 A.M. The Missing Link. Synopsis, Origin. In What Way Does It Concern the Orthodontist? In What Way Does It Concern the General Practitioner? Remedy (Illustrated). By R. C. Willett, Peoria, Ill.

Discussed by O. W. Brandhorst, St. Louis, Mo., and R. L. Webster, Providence, R. I.

11:40 A.M. Two Distoclusion Cases. Case *A*, Bilateral Distoclusion With Labioversion of the Maxillary Incisors. Case *B*, Bilateral Distoclusion With Linguoversion of the Maxillary Incisors, Complicated With the Extreme Unilateral Linguoversion of the Mandibular Molars and Premolars. By J. E. Johnson, Louisville, Ky.

12:15 P.M. Lunch.

Afternoon Session

1:30 P.M. The Delineasope a Convenient Adjunct in Record Keeping. By L. M. Waugh, New York, N. Y.

2:00 P.M. Identical Twins. Case Report. H. A. Denbo, Chicago, Ill.

2:30 P.M. Tissue Changes, the Result of Tooth Movement. By L. F. Rittershafer, Ann Arbor, Mich.

3:15 P.M. Business Session.

Closing Session.

Installation of Officers.

Adjournment.

Committees Appointed for the American Society of Orthodontists Annual Convention to Be Held in St. Louis

General Arrangements Committee:
Dr. Frank C. Rodgers
Dr. O. W. Brandhorst
Dr. H. C. Pollock

Exhibits Committee:
Dr. Jos. H. Williams
Dr. H. F. Westhoff

Committee for Ladies' Entertainment:
Dr. Leo M. Shanley, Chairman
Dr. George Herbert.

Banquet Committee:
Dr. George Herbert
Dr. A. C. Mogler

Golf Committee:
Dr. Leo. M. Shanley
Dr. Frank C. Rodgers

Equipment Committee:
Dr. E. Holstine, Chairman

Details pertaining to hotel arrangements should be taken up direct with Mr. Wm. Schneider, Convention Manager, Jefferson Hotel, St. Louis, Mo.

The American Board of Orthodontia

A meeting of the American Board of Orthodontia will be held at Hotel Jefferson, St. Louis, Mo., on April 20, 1931, at 9 A.M.

Those orthodontists who desire to quality for a certificate from the Board should secure the necessary application form from the Secretary. Attention is called to the following resolutions adopted by the Board.

Any person desiring to make application to the Board for a certificate shall have been in the exclusive practice of orthodontia for a period of not less than five years or an equivalent to be determined by the Board and based upon the following conditions.

First, an instructor in orthodontia in a school satisfactory to the Board.

Second, an associate in the office of an orthodontist whose standing is satisfactory to the Board.

It is, however, to be definitely understood that any person at the time of making application for a certificate shall be in the exclusive practice of orthodontia in his own name.

ALBERT H. KETCHAM, President,
1232 Republic Building,
Denver, Colo.

OREN A. OLIVER, Secretary,
1101 Medical Arts Building,
Nashville, Tenn.

Georgia State Dental Hygienist Association

The annual meeting of the Georgia State Dental Hygienist Association will be held June 10 and 11, 1931, at the Biltmore Hotel, Atlanta, Ga.

MRS. M. W. ALMAND, JR., President.
LOUISE HALL, Secretary.

Society for the Advancement of General Anesthesia in Dentistry

The annual meeting of the Society for the Advancement of General Anesthesia in Dentistry will be held Monday evening, April 20, at the Hotel Barbizon-Plaza, 58th Street and Sixth Avenue, New York City.

Dr. William Branower will discuss "Poor Anesthetic Risks in Dental Surgery," and Dr. Morris D. Senft will give a short talk from the standpoint of the general practitioner in dentistry on "The Possibilities and the Limitations of General Anesthesia in General Practice."

The meeting will begin with a dinner at 7 P.M., and the scientific session will be opened at 8 o'clock. Those wishing to attend the dinner can communicate with any of the following officers. Attendance at the scientific session is open to the profession.

M. HILLEL FELDMAN, President,
730 Fifth Avenue,
New York City.

LEONARD MORVAY, Secretary,
76 Clinton Avenue,
Newark, N. J.

JAMES T. GWATHMEY, Honorary President,
30 W. 59th Street,
New York City.

The Eastern Association of Graduates of the Angle School of Orthodontia

The annual meeting of the Eastern Association of Graduates of the Angle School of Orthodontia will be held May 4 and 5, 1931, at the Vanderbilt Hotel, Park Avenue and 34th Street, New York City.

E. SANTLEY BUTLER, Secretary,
576 Fifth Avenue,
New York City.

Washington University School of Dentistry Announces Course in Exodontia

Starting Monday, June 8, 1931, Dr. George B. Winters of St. Louis, Mo., will conduct the annual summer course in Advanced Exodontia at Washington University School of Dentistry, St. Louis, Mo.

RUSSELL G. FOBES, Registrar,
Washington University, Dental Dept.,
4559 Scott Avenue,
St. Louis, Mo.

Third International Congress of Radiology

The following questions will be discussed at the third International Congress of Radiology which will be held in Paris July 26 to 31, 1931:

(1) Radiologic Examination of the Mucosa of the Digestive Tube.

(2) Radiologic Examination of the Urinary Apparatus by Excretion of Opaque Substances.

(3) Preoperative and Postoperative Treatment of Cancer of the Breast by Radiation (Recurrency and Metastases Excepted).

(4) Radiotherapy of Inflammatory Diseases.

(5) Diathermic Electrotherapy of Inflammatory Diseases.

At a general meeting, all sections being present, a thirty minutes' lecture will be given on each of these subjects. All congress members are invited to give the results of their experience on these questions both by special communication and during general discussion.

TRAVELS IN FRANCE

Congress members will benefit by a reduction of 50 per cent on the fare to and from the Congress on the French railways.

After the Congress several tours at reduced prices will be organized to different parts of France, including visits to various thermal and mineral watering places.

Particulars on the above-mentioned reduced rates on railway fares and on the tours after the Congress will be forwarded from the offices of the Congress to members who have paid their dues.

All information concerning hotel prices for the stay in Paris will also be forwarded.

The subscription fee is 300 French francs for members and 50 French francs for persons belonging to the member's family.

The summaries of the communications, not more than four hundred typewritten words, in English, French, or German, must be sent in before April 1, 1931.

All correspondence is to be addressed to the Offices of the Third International Congress of Radiology, 122 Rue La Boëtie, Paris 8ème, France.

R. LEDOUX-LEBARD, Secretary.

The Dental Hygienists Association of the State of New York

The Dental Hygienists Association of the State of New York will hold its eleventh annual meeting, May 12 to 15, 1931, inclusive, at the Hotel Pennsylvania, New York City.

The following speakers will take part in the program: Dr. Ira S. Wile of Mt. Sinai Hospital, of the College of the City of New York, of Hunter College, and of the School of Social Research; Dr. Van Alstyne, Supervisor of Oral Hygiene, Department of Education, Albany, N. Y.; Dr. Lois Hayden Meek, Director of Child Development Institute and Professor of Education at Columbia University.

Discussions on interesting topics have been arranged.

A cordial invitation is extended to members of the dental profession, dental hygienists and dental assistants.

EVELYN M. GUNNARSON, President,
475 Fifth Avenue,
New York City.

MABEL ERCKERT, Corresponding Secretary,
18 East Forty-Eighth Street,
New York City.

Second International Orthodontic Congress

The Second International Orthodontic Congress will be held in London July 20 to 24, 1931. The headquarters will be the Savoy Hotel (and not the Hotel Great Central as previously announced).

A full program of papers and demonstrations has been arranged, and a museum will be a prominent feature of the Congress.

An attractive social program for members and those accompanying them is in course of preparation.

Letters setting out the conditions under which contributions to the proceedings are invited, together with copies of the Congress rules and application forms for membership, have been sent to all known to be interested in orthodontics, and the Secretary-General (Mr. B. Maxwell Stephens, 76 Grosvenor Street, London, W. 1, England) will be glad to send all such information to anyone applying for it.

Regular membership of the Congress (cost £ 2-2-0 per member) is limited to those who are members of organizations which are component societies of the Congress.

Subscribing membership (cost £ 2-2-0 per member) is open to all persons of repute irrespective of society membership. Subscribing members have no right to vote or to hold office in the Congress.

J. H. Badcock, President,
B. Maxwell Stephens, Secretary General.